PAINT and VARNISH Production

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

FIRST WITH ALKYDS... FIRST FOR FINER FINISHES

WHY YOU'LL FIND G-E COATING MATERIALS *"FIRST AT THE FINISH"*

1 **UNIFORM QUALITY FOR UNIFORM END PRODUCTS**—the result of years of experience in formulating paint resins

2 **EXPERT TECHNICAL SERVICE**—readily available from General Electric resin and paint specialists

3 **COMPETITIVE PRICES FOR ECONOMICAL FORMULATIONS**—to help you make finer finishes at low cost

4 **PROMPT DELIVERIES**—through five plants in the U.S. and Canada plus strategically located warehouses

Which of these G-E coating materials can help you MAKE FINER FINISHES?

1 **G-E GLYPTAL® ALKYD RESINS** — industry-famous vehicles for decorative and protective coatings

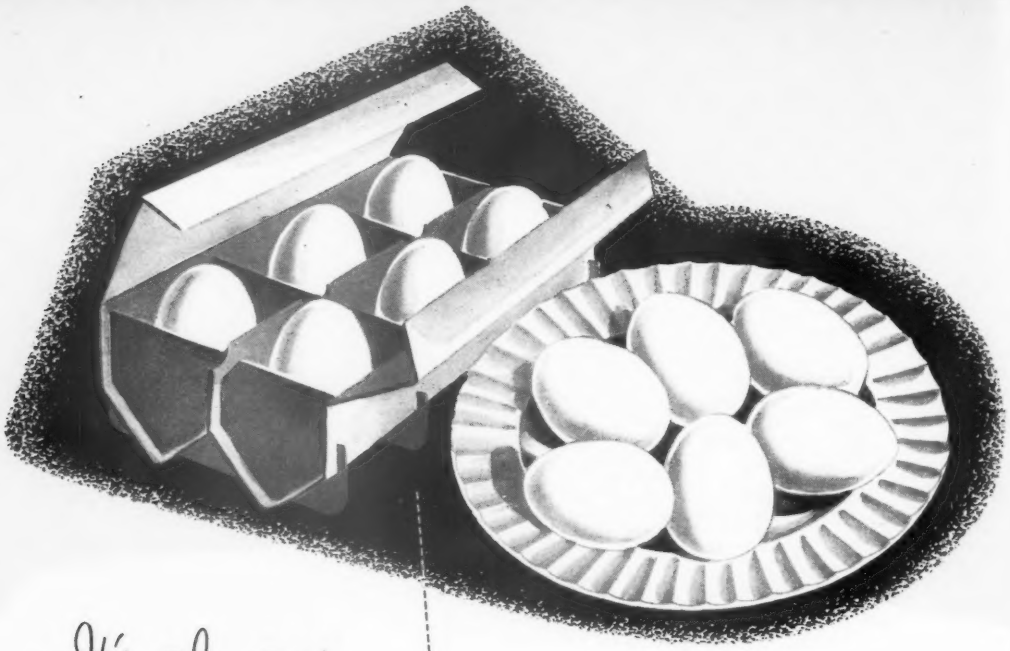
2 **G-E METHYLON® RESINS**—key to chemical- and corrosion-resistant coatings

3 **G-E SILICONE PRODUCTS**—new materials for building exceptional heat resistance and water repellency into formulations

A G-E SPECIALIST is always available to discuss your paint problems. Just write to Chemical Materials Department, Section 511-5A, General Electric Company, 77 River Road, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



It's always

SIX FOR YOU and A HALF DOZEN FOR US

—when you call upon our laboratory facilities

Have you a current problem with a new formula —or a new vehicle? We invite the opportunity to help you work it out.

Are you interested in *emulsion paints, thixotropic enamels, odorless finishes, sanitary coatings, mildew-resistance, alkyds, blister-resistant house paints* . . . ? We have new developments in all these types—and many more.

The services of our Laboratory Staff are—at all times—available to you. A great deal of their time is devoted to the current problems of our customers. Year in and year out, this works out well . . . a solution for you—another satisfied customer for us.

Specialized laboratory service to meet customer needs is the keystone of Nuodex leadership in the field of paint additive applications. Call upon these services through your regular Nuodex Representative or by writing us direct.

NUODEX

NUODEX PRODUCTS CO., INC., Elizabeth, N. J.

Plants in Elizabeth, N. J., Newark, N. J., Long Beach, Calif., and throughout the world

A SUBSIDIARY OF HEYDEN CHEMICAL CORPORATION

SEE YOUR NEAREST NUODEX REPRESENTATIVE

ATLANTA, Georgia
R. T. Hopkins

BOSTON, Massachusetts
D. H. Litter Co., Inc.

BUFFALO, New York
Commercial Chemicals Inc.

CHICAGO, Illinois
J. W. Van Tuin Company

CINCINNATI, Ohio
B. H. Roettker Company

CLEVELAND, Ohio
A. C. Mueller Co.

DALLAS, Texas
Thompson-Hayward Chemical Co.

DAVENPORT, Iowa
Thompson-Hayward Chemical Co.

DENVER, Colorado
Thompson-Hayward Chemical Co.

DES MOINES, Iowa
Thompson-Hayward Chemical Co.

DETROIT, Michigan
Baker & Collinson

HOUSTON, Texas
Thompson-Hayward Chemical Co.

INDIANAPOLIS, Indiana
Indiana Naval Stores Co.

KANSAS CITY, Missouri
Abner Hood Chemical Company

LITTLE ROCK, Arkansas
Thompson-Hayward Chemical Co.

LOS ANGELES, California
Nuodex Products Co., Inc.

LOUISVILLE, Kentucky
B. H. Boyet & Company

MEMPHIS, Tennessee
Thompson-Hayward Chemical Co.

MILWAUKEE, Wisconsin
R. L. Ferguson

MINNEAPOLIS, Minnesota
Thompson-Hayward Chemical Co.

NASHVILLE, Tennessee
Post Brokerage Company

NEW ORLEANS, Louisiana
Thompson-Hayward Chemical Co.

NEW YORK, New York
D. H. Litter Co., Inc.

OKLAHOMA CITY, Oklahoma
Thompson-Hayward Chemical Co.

OMAHA, Nebraska
Thompson-Hayward Chemical Co.

PHILADELPHIA, Pennsylvania
Harry W. Gaffney

PITTSBURGH, Pennsylvania
John D. Butts

PORTLAND, Oregon
Fred E. Alsop & Co.

RICHMOND, Virginia
F. V. Gunn & Co., Inc.

ST. LOUIS, Missouri
J. E. Niehaus & Co.

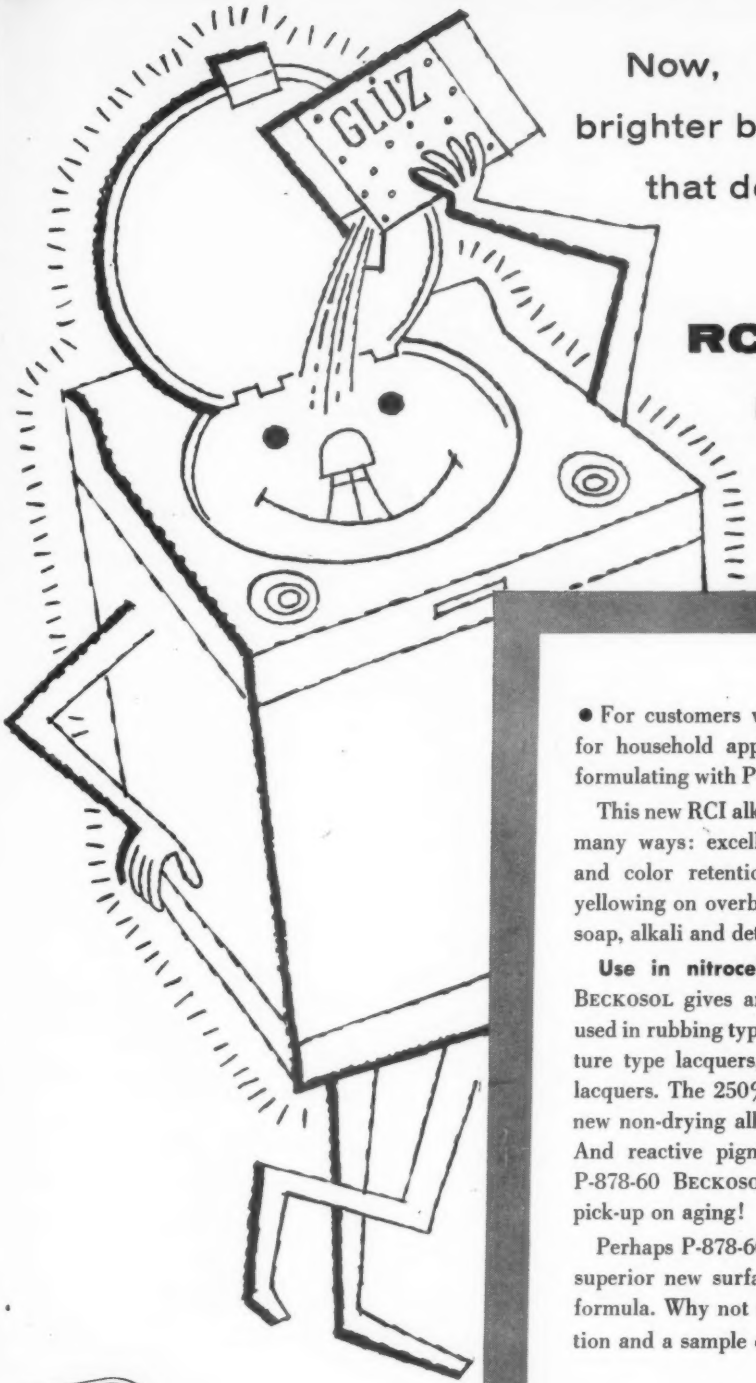
SAN ANTONIO, Texas
Thompson-Hayward Chemical Co.

SAN FRANCISCO, California
Cole & DeGraf

SEATTLE, Washington
D. B. Smith

TULSA, Oklahoma
Thompson-Hayward Chemical Co.

WICHITA, Kansas
Thompson-Hayward Chemical Co.



Now,
brighter baked enamels
that detergents
won't dull!

RCI develops a new non-drying alkyd resin

● For customers who need a "super" baking enamel for household appliances, we suggest that you start formulating with P-878-60 BECKOSOL and amine resins!

This new RCI alkyd provides superior performance in many ways: excellent initial color, outstanding gloss and color retention, improved ability to withstand yellowing on overbake, high resistance to the effects of soap, alkali and detergent solutions.

Use in nitrocellulose lacquers, too — P-878-60 BECKOSOL gives an exceptionally durable gloss when used in rubbing type automotive lacquers, in clear furniture type lacquers, and in rigidly controlled aircraft lacquers. The 250% aliphatic solvent tolerance of this new non-drying alkyd permits latitude in formulating. And reactive pigments can be dispersed directly in P-878-60 BECKOSOL with very little or no viscosity pick-up on aging!

Perhaps P-878-60 BECKOSOL can help you develop a superior new surface coating, or improve an existing formula. Why not write RCI for formulating information and a sample of this new non-drying alkyd?

RCI

Creative Chemistry . . .
Your Partner
in Progress

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sodium Sulfite • Pentaerythritol • Pentachlorophenol
REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

for the paint, varnish

and lacquer industry

acetone
n-butyl acetate
ethyl acetate
2-ethylhexyl alcohol
isobutyl acetate
isobutyl alcohol
isopropyl acetate
Tecsol®
(95% proprietary
ethyl alcohol)

cellulose acetate
cellulose acetate butyrate

dibutyl phthalate
diethyl phthalate
dioctyl phthalate (DOP)
di-isooctyl phthalate (DIOP)
di-(methoxyethyl) phthalate
dimethyl phthalate
di-isobutyl phthalate
plasticizer 84-an
octyl butyl phthalate

Epolene®
(Eastman polyethylene wax)

Stocks of most of these Eastman chemicals are carried
in the larger industrial centers of the United States.
For further information, write or call our nearest sales office.

Eastman
CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE
subsidiary of Eastman Kodak Company

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; New York City; Framingham, Mass.; Cleveland; Cincinnati; Chicago; St. Louis; Houston. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

PAINT and VARNISH Production

COPIES
OF THE
1953 and 1954
ISSUES
ARE ALSO
AVAILABLE
WRITE OR PHONE
To Address
Directly Below

(REG. U.S. PATENT OFFICE)
Formerly PAINT and VARNISH PRODUCTION MANAGER
(Established in 1910 as The Paint and Varnish Record)

VOL. 46 FEBRUARY, 1956 NO. 3

1955 REVIEW OF THE PAINT INDUSTRY

Published Monthly by
Powell Magazines, Inc.
Executive and Editorial Offices
855 Ave. of Americas
New York 1, N. Y.
BRyant 9-0499

Compiled and Edited by
SAM RUGGERI
IN COLLABORATION WITH THE EDITORIAL STAFF OF PAINT AND VARNISH PRODUCTION

JOHN POWELL, *Publisher*
ANTHONY ERRICO, *Editor*
MONROE ALTER
Ass't. Editor
A. L. BENDER
Production Manager
WM. R. KELLY
Circulation Manager
PHILIP J. SEAVEY
Advertising Manager
D. P. MACPHERSON
700 S. Washington Sq.
Philadelphia, Pa.
LOmbard 3-9982
JONES & LYNCH
228 N. La Salle St.,
Chicago 1, Ill.
State 2-5096
Advertising Representatives
McDONALD-THOMPSON
West Coast Representatives

MEMBER BUSINESS BPA PUBLICATIONS AUDIT, INC.

PAINT and VARNISH PRODUCTION is published monthly except semi-monthly in February at Easton, Pa. by Powell Magazines, Inc. John Powell, president; Ira P. MacNair, vice-president and treasurer; Alice L. Lynch, secretary. Entered as second class matter at Post Office at Easton, Pa., Jan. 30th, 1952, under the Act of March 3, 1879. Subscription rates: United States and Possessions, $3.00 a year, $5.00 for two years, $10.00 for five years. Single copies 50c each. Canada, $4.00 a year. Pan American Countries, $4.00 a year. All other countries $8.00. Editorial and business office: 855 Avenue of the Americas, New York 1, N. Y. BR-9-0499.

TABLE OF CONTENTS

HOW TO USE THIS REVIEW 9
LIST OF PUBLICATIONS ABSTRACTED ... 10

	Paragraph	Page
CHAPTER 1 — GENERAL		11
Highlights	1.1	11
General	1.2	11
Employee-Employer Relations	1.3	13
Legal	1.4	14
Sales	1.5	14
CHAPTER 2 — GENERAL RESINS		15
General	2.1	15
Vehicles	2.2	18
CHAPTER 3 — ACRYLICS		19
General	3.1	19
CHAPTER 4 — ALKYDS		21
General	4.1	21
Maleic	4.2	23
Silicone-Alkyds	4.3	23
Styrenated	4.4	24
CHAPTER 5 — CELLULOSE DERIVATIVES		25
General	5.1	25
Cellulose Nitrate	5.2	25
Cellulose Acetate	5.3	26
Cellulose Acetate Butyrate	5.4	26
Ethyl Cellulose	5.5	26
Carboxymethylcellulose	5.6	26
Methylcellulose	5.7	26
Hydroxyethylcellulose	5.8	26
Ethyl Hydroxyethylcellulose	5.9	26
CHAPTER 6 — EPOXY RESINS		27
General	6.1	27
Epoxy Esters	6.2	28
Epoxy Phenolic	6.3	28
Epoxy Amines	6.4	29
CHAPTER 7 — HALOGEN-CONTAINING RESINS		29
General	7.1	29
Chlorinated Rubber	7.2	29
Chlorinated Polyphenyls	7.3	29
Chlorinated Paraffin	7.4	29
CHAPTER 8 — HYDROCARBON RESINS		30
General	8.1	30
Coumarone-Indene	8.2	31
Petroleum Hydrocarbons	8.3	32
Terpene Resins	8.4	32
Butadiene-Styrene Resins	8.5	32
Asphalts & Other Bitumens	8.6	32
CHAPTER 9 — NITROGEN-CONTAINING RESINS		35
General	9.1	35
Melamine-CH2O	9.2	35
Urea-CH2O	9.3	36
Polyurethane	9.4	36
CHAPTER 10 — NATURAL RESINS		37
General	10.1	37
Shellac	10.2	37
CHAPTER 11 — PHENOLICS		38
General	11.1	38
Pure Phenolics	11.2	38
Modified Phenolics	11.3	38
Maleics	11.4	38
CHAPTER 12 — POLYAMIDES		39
General	12.1	39
Polyamide-Epoxy Resins	12.2	39
CHAPTER 13 — POLYETHYLENE AND MODIFIED POLYETHYLENES		40
Polyethylene	13.1	40
Modified Polyethylenes	13.2	40
Halogenated Polyethylenes	13.3	40
CHAPTER 14 — POLYSTYRENE		41
General	14.1	41
CHAPTER 15 — ROSIN AND ROSIN DERIVATIVES		42
General	15.1	42
CHAPTER 16 — SILICONES		43
General	16.1	43
CHAPTER 17 — UNSATURATED POLY-ESTERS		46
General	17.1	46
Allyl	17.2	46
Polyester-Urethane	17.3	46

	Paragraph	Page
CHAPTER 18 — VINYLS		47
General	18.1	47
Polyvinyl Acetate	18.2	48
Polyvinyl Chloride	18.3	48
Polyvinyl Chloride-Acetate Copolymers	18.4	49
Polyvinyl Alcohol	18.5	49
Polyvinyl Acetal	18.6	49
Polyvinyl Butyral	18.7	49
Polyvinyl Formal	18.8	49
Vinylidine Chloride Polymers & Copolymers	18.9	49
CHAPTER 19 — EMULSION POLYMERS		50
General	19.1	50
Acrylic	19.2	50
Polystyrene	19.3	52
Polyvinyl Acetate	19.4	52
Chlorinated Natural Rubber	19.5	53
Butadiene-Styrene	19.6	53
Alkyd	19.7	54
Neoprene	19.8	54
Vinylidene Chloride Polymers	19.9	54
Silicone	19.10	54
Polyvinyl Chloride	19.11	54
Petroleum Hydrocarbons	19.12	54
Natural Rubber (Latex)	19.13	54
Asphalt	19.14	54
Epoxy	19.15	54
CHAPTER 20 — PLASTICIZERS		56
General	20.1	56
Chemical	20.2	56
Resinous	20.3	56
Oils	20.4	56
CHAPTER 21 — PIGMENTS		57
General	21.1	57
White	21.2	57
Extenders	21.3	59
Iron Oxides	21.4	60
Red	21.5	62
Yellow & Orange	21.6	62
Green	21.7	62
Blue & Violet	21.8	64
Black	21.9	64
Metallic Flakes & Powders	21.10	64
Luminous	21.11	64
Metal Protective	21.12	64
Dispersions	21.13	65
Dyes	21.14	65
CHAPTER 22 — SOLVENTS		67
General	22.1	67
Aliphatic Hydrocarbons	22.2	67
Aromatic Hydrocarbons	22.3	71
Oxygen Containing	22.4	71
Halogen Containing	22.5	72
Nitrogen Containing	22.6	72
Terpene	22.7	72
CHAPTER 23 — OILS, FATTY ACIDS, FATTY ALCOHOLS		73
General	23.1	73
Linseed	23.2	75
Castor & Dehydrated Castor	23.3	75
Tung	23.4	76
Soybean	23.5	76
Oiticica	23.6	76
Fish	23.7	76
Tall	23.8	76
Safflower	23.9	77
Synthetic Drying Oils	23.10	77
Fatty Acids	23.11	77
Fatty Alcohols	23.12	78
CHAPTER 24 — MISCELLANEOUS RAW MATERIALS		81
General	24.1	81
Driers	24.2	81
Fungicides	24.3	81
Metallic Soaps	24.4	83
Surface Active Agents	24.5	85
Grinding & Dispersing Agents	24.6	88
Emulsifiers	24.7	88
Stabilizers	24.8	88
Thickeners	24.9	91
Waxes	24.10	91
Anti-foaming Agents	24.11	91
Ultra-violet Absorbers	24.12	91
Fire Retardants	24.13	92
Anti-skinning Agents	24.14	92
Deodorants	24.15	92
Polymerization Catalysts	24.16	92
CHAPTER 25 — INTERMEDIATES		93
General	25.1	93
Polybasic Acids	25.2	93
Polyols	25.3	93
Aldehydes	25.4	96
Phenols	25.5	96
Amines	25.6	96
Monomers	25.7	96
CHAPTER 26 — ARCHITECTURAL COATINGS		98
General	26.1	98
Interior Wall Paint	26.2	98
Fire-retardant Coatings	26.3	98
Exterior House Paint	26.4	99
Maintenance Painting	26.5	99
Coatings for Masonry	26.6	100
Texture Paints	26.7	100

	Paragraph	Page
CHAPTER 27 — INDUSTRIAL COATINGS		101
General	27.1	101
Primers & Sealers	27.2	103
Metal-protective Coatings	27.3	103
Metal-decorative Coatings	27.4	104
Organosols & Plastisols	27.5	105
Automotive Finishes	27.6	105
Lacquers	27.7	105
Coatings for Textiles	27.8	106
Coatings for Rubber	27.9	106
Furniture & Wood Finishes	27.10	106
Printing Inks	27.11	106
Putty & Caulking Compounds	27.12	106
Adhesives	27.13	106
Electrical Insulation	27.14	107
Traffic Paint	27.15	107
Coatings for Plastics	27.16	107
Coatings for Paper	27.17	107
Fungicidal Paints	27.18	108
Anti-fouling Paints	27.19	108
Wrinkle Finishes	27.20	108
Crackle Finish	27.21	108
CHAPTER 28 — EMULSION COATINGS		109
General	28.1	109
Exterior Masonry	28.2	110
Interior Wall Paint	28.3	110
CHAPTER 29 — SURFACE PREPARATION		111
General	29.1	111
Phosphate Type Treatments	29.2	112
Paint Removers	29.3	112
CHAPTER 30 — APPLICATION METHODS AND EQUIPMENT		113
General	30.1	113
Spray	30.2	114
Aerosol	30.3	115
Roller	30.4	115
Dip & Flow	30.5	115
Brush	30.6	116
Knife	30.7	116
CHAPTER 31 — DRYING		117
General	31.1	117
Infra-Red	31.2	117
CHAPTER 32 — CHEMICAL REACTIONS		118
General	32.1	118
Polymerization	32.2	118
Oxidation	32.3	120
Epoxidation	32.4	120
CHAPTER 33 — VEHICLE MANUFACTURE		120
General	33.1	120
CHAPTER 34 — PAINT MANUFACTURE		121
General	34.1	121
Mixing & Agitation	34.2	121
Grinding	34.3	123
Packaging & Labeling	34.4	125
Straining & Clarifying	34.5	125
Quality Control	34.6	126
Fume Control	34.7	126
CHAPTER 35 — MATERIALS HANDLING		127
General	35.1	127
Pumping	35.2	127
Motors	35.3	127
Piping & Hoses	35.4	128
CHAPTER 36 — SAFETY		129
General	36.1	129
Solvents	36.2	129
CHAPTER 37 — PERFORMANCE TESTING		130
General	37.1	130
Drying Time	37.2	131
Weathering	37.3	131
Scrub Resistance	37.4	132
Gas Checking	37.5	132
Cold Checking	37.6	132
Abrasion Resistance	37.7	132
Water Resistance	37.8	132
Adhesion	37.9	132
Freeze-thaw Stability	37.10	133
Moisture Permeability	37.11	133
Hiding Power	37.12	133
CHAPTER 38 — ANALYTICAL TESTING		135
General	38.1	135
Hardness	38.2	136
Optical (Color)	38.3	136
Viscosity Measurement	38.4	136
Molecular Weight Determination	38.5	137
Statistical Analysis	38.6	138
Analysis for Content	38.7	138
Spectroscopy	38.8	139
Electron Microscopy	38.9	140
Particle Size	38.10	140
Film Thickness	38.11	140
Melting Point	38.12	140

APPENDIX 141
- Subject Index 141
- Authors' Index 145
- Suppliers Directory 149
- Trade Associations 155
- Trade Name Directory 156
- Advertisers' Index 162

HOW TO USE THIS REVIEW

WITH this 1955 REVIEW of the PAINT INDUSTRY, we take pride in bringing to you, our readers, the fourth in a series of yearly summaries of the current technological developments in the paint industry. When used in conjunction with the previous (and subsequent) reviews, the series forms a valuable index to the technical literature and a source for information relating to the various phases of the paint industry.

As illustrated in the Table of Contents, the material is presented in a related pattern. The format used provides 38 chapters. Each chapter is sub-divided into various sub-headings, the number varying from one chapter to another. In evolving this format an attempt was made to provide as many "niches" as necessary to cover the industry thoroughly while keeping the number to a minimum.

There are many ways to use this volume to good advantage. The Table of Contents provides an overall picture of the format as well as providing a reference to general subjects. A more detailed subject reference is to be found in the Subject Index (page 141) in the Appendix. The Authors' Index (page 145) is provided in the Appendix to aid the reader who recalls only the name of the writer of the information he is seeking. Both of these indices refer to specific items rather than to journal references.

Each item reference number is a three digit number such as 18.1.4. The first digit (18) refers to chapter eighteen; the second digit (1) refers to subheading one; and the last digit (4) refers to the fourth item in the sub-heading.

The specific item refers the reader to the journal reference for further reading. Journal references appear at the end of each item. For example the reference IEC, 47, #2, 2/55 p 302 is broken down as follows:

IEC—"Industrial Engineering Chemistry"
(For codes of all publications in this review see page 10)

47—Volume 47

#2—No. 2

2/55—2nd month of year (February) 1955

p 302—The subject referred to begins on page 302.

Many items come under the scope of more than one heading. Obviously, these items could not be included under all headings. Such articles have been catalogued in one "niche" and cross-referenced under the others. These cross-references, immediately following the last item under each sub-heading within a chapter, should also be consulted along with the items for a complete picture of developments within the sub-heading.

A list of suppliers is included at the end of each sub-heading within a chapter. Since this review is aimed at the paint industry, a listing has not been included in Chapters 26, 27, and 28. Addresses of all companies and firms listed throughout the chapters may be found in the Appendix (page 149). A list of trade associations together with their addresses is also included in the Appendix (page 155). A complete compilation of suppliers' trade names of interest to the paint industry may be found in the Appendix.

THE AUTHOR

Sam Ruggeri, a New York State Licensed Professional Engineer, with a degree in Chemical Engineering from the College of the City of New York, is connected with Alfred Hague & Co., Inc. He has been active in the formulation of coating materials for specialized uses and in writing Bureau of Ordnance (U.S. Navy) specifications on coatings for fungus-proofing electrical and electronic equipment. He is a member of the National Society of Professional Engineers, American Chemical Society, American Society for Testing Materials, Society for Industrial Microbiology, the New York Academy of Sciences and the New York Paint and Varnish Production Club.

LIST OF PUBLICATIONS ABSTRACTED AND THEIR CODES

AC	Analytical Chemistry
APJ	American Paint Journal
ASTM	ASTM Bulletin
C	Corrosion
CE	Chemical Engineering
CEN	Chemical and Engineering News
CPVM	Canadian Paint and Varnish Magazine
FMM	Factory Management and Maintenance
IEC	Industrial and Engineering Chemistry
IF	Industrial Finishing
IR	Interchemical Review
JACS	Journal of the American Chemical Society
JAOCS	Journal of the American Oil Chemists' Society
JOCCA	Journal of the Oil and Colour Chemists' Association
JPS	Journal of Polymer Science
MM	Materials and Methods
MF	Metal Finishing
MP	Modern Plastics
OD	Official Digest
OF	Organic Finishing
PE	Product Engineering
PF	Products Finishing
PI	Paintindia
PIM	Paint Industry Magazine
PL	Paint Logic
PM	Paint Manufacture
POCR	Paint, Oil and Chemical Review
PT	Paint Technology
PVP	Paint and Varnish Production
USP	United States Patent

"This card from you will be the nicest thing in our mail tomorrow"

It's the easiest way, too, for you to let us know how well these PAINT AND VARNISH PRODUCTION REVIEWS OF THE PAINT INDUSTRY are serving you.

In your opinion does this Review serve a useful purpose? Yes ☐ No ☐

Do you use it regularly? ☐ Occasionally? ☐

Does it help to keep you abreast of latest technical developments? Yes ☐ No ☐

Does it serve as a check list for new raw materials and equipment through Raw Materials and Equipment Listings? Yes ☐ No ☐ Advertisements? Yes ☐ No ☐

Is it also used by your Tech. Dir.? ☐ Chemists? ☐ Formulators? ☐ Production Supt.? ☐ Purchasing Agent? ☐

Your suggestions for improvement. . . . . .

. . . . . .

. . . . . .

. . . . . NAME. . . . . (Please print)

. . . . . TITLE: . . . . . .

. . . . . COMPANY: . . . . . .

. . . . . ADDRESS: . . . . . .

. . . . . CITY. . . . . ZONE. . . . STATE. . . . . .

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 54832, Sec. 34.9 P. L. & R., New York, N. Y.

PAINT & VARNISH PRODUCTION

855 Avenue of the Americas

New York 1, N. Y.

CHAPTER 1

GENERAL

1.1.1. 1955 was a record year for the paint industry.

Recent figures released by the Bureau of Census (Dept. of Commerce) show that total sales for 1955 amounted to $1,516,224,000. Compared to 1954 this was an increase of some 10.8%.

Factors contributing to this increase in sales volume of paint products during the past year were:

1. High construction activity
2. Record automobile production of some 8 million units
3. High level of redecoration, maintenance, and improvements by home owners, industry, and public works

In assessing the technological developments which took place in the paint industry, one finds that emulsion coating technology commanded the highest interest. This was evidenced by the introduction of several new latex polymers (particularly the polyvinyl acetate type), additives and pigments designed specifically for use in latex systems.

Considerable interest was also noticed in a thixotropic vehicle which has gained wide acceptance in the formulation of dripless paint —a product designed particularly for the "do-it-yourself" consumer. Other important developments included multicolored lacquers based on an aqueous lacquer dispersion; a terephthalate ester for wire coatings; catalyzed phenolics for air-dry and low temperature conversion coatings; silicone vehicle for high heat and weather resistant coatings; plasticizer with fire-retardant properties; low odor alkyd vehicles; linseed grinding oils for one coat systems; emulsifiable polyethylenes; epoxy resin emulsion; coumarone-indene for improving freeze-thaw stability in latex systems; new intermediates such as isophthalic acid, itaconic acid esters, isosebacic acid, improved pentaerythritols, resinous polyalcohol, hydroxpivaldehyde, malonaldehyde diacetal, dodecenylsuccinic anhydride; curing agents for epoxy resins; additive for alkyd reduction in odorless solvent.

Pigment manufacturers have also introduced new lines for coating application. In this field interest was shown in alkali-resistant pigments for use in emulsion systems, strontium chromate as a rust inhibitor in aluminum paints, improved carbon balck for easy dispersion, a line of synthetic calcium silicates as an improved extender, and siliceous pigment extenders.

The possibility of utilizing radioisotopes as a research tool in paint technology have been envisioned during 1955. These include: determining the homogenuity of mixing and grinding, determining the solubility properties of solvents, determining the degree of pigment wetting and sedimentation, detecting pin holes and other film failures, studying corrosion, measuring film thickness, measuring wearing properties of a coating or wax, investigating permanency of plasticizers, evaluating rust preventives, inducing polymerization, etc.

1.2.1. An open forum discussion in San Francisco (March, 1954) covered the subject of how technical departments coordinate with production and sales. The panel, composed of members of the Golden Gate Club's Technical Committee, included both raw materials and paint manufacturers. The importance of the technical man working closely together with raw material salesmen, production men in the plant, and the sales department is discussed. OD, 26, #357, 10/54 p. 924

1.2.2. A painting contractor today is, or should be, a different type of person than his predecessors. So states Exley in "A Contractor Looks at Paint". His discussion includes calsomine, lead and oil, today's market, responsibility of the manufacturer, and importance of color. OD, 26, #357, 10/54, p. 944

1.2.3. Long, presenting the 1954 Joseph J. Mattielo Memorial lecture, discusses creative imagination as it applies to the decorative and protective coatings industry. The first part of his paper covers some considerations of film structure and its influence on film properties. An extensive discussion of critical pigment volume concentration is included. Some calculations of film structure oil oriented are discussed. The second part discusses thoughts on inter-related considerations incident to mechanical and physico-chemical strength properties of paint films. Adhesion, effect of surface, looking ahead, salesmanship, new products should be really new, we should develop a formula for ball mill operation, and tracer elements are discussed. (OD, 26, #358, 11/54, p. 989)

1.2.4. The Golden Gate Club presents a paint industry literature classification. The card used in this classification was designed with the following indexes:

1. Processes, Properties and Raw Materials Index
2. Author and Source Index
3. Chemical Index
4. Common Variable Index

A general description of the system is presented and the punched cards are illustrated. Tables of suggested source index and the various processes, properties, and materials headings are presented. OD, 26, #358, 11/54, p. 1108

1.2.5. Barrett discusses the paint industry as a career. Two points should be considered in choosing a prospective industry for a career. First, "What has been the progress of the particular industry under consideration?" Second, "What can that industry offer in the way of continued progress and prosperity in a very personal way?"

An important consideration before entering an industry is to decide what phase is most desirable,—sales, research, production, industrial relations, or management. Following a discussion of the two important questions, as noted, the author discusses paint in colonial times, compensation, and your progress in "you." OD, 27, #361, 2/55, p. 58

1.2.6. Schwahn presents a review of surface coatings developments. Included are phenolic coating resins, air-dry coatings, baking coatings, dispersion coatings, vinyl coating resins, solution coatings, wash primers, vinyl dispersion coatings, and latex surface coatings. OD, 27, #361, 2/55, p. 63

1.2.7. Mann presents a color forecast for 1955. The predominance of white of the previous season has continued with a growing importance of pink or blue pastels being a new feature of color styles. APJ, 39, #3, 10/4/54, p. 92

1.2.8. Kronstein discusses the scope of surface technology. Surface technology is a complex field of engineering, of chemistry, and of physics, which allows a systematical development and application of individual surface treatments and coating materials as will improve and protect the various kind of surfaces which are under technological treatment. It is a field also where human relations and the cooperation of individuals and groups has a great influence on the final success of the daily operations. APJ, 39, #5, 10/18/54, p. 30

1.2.9. Khan reviews the paint industry in Pakistan. The author covers the paint industry, raw materials, specifications, and other general information. APJ, 39, #13, 12/13/54, p. 52

1.2.10. What do you do when you have a problem? Do you make full use of the services offered by the raw material supplier? This article shows how helpful the raw material supplier can be. PVP, 44, #10, 10/54, p. 33

1.2.11. Kienle reviews the protective coatings industry—a practical science. This is a reprint of the "keynote address" of the 31st Annual meeting of the U. S. Federation of Paint and Varnish Production Clubs, held in Atlantic City, N. J. recently. The lecture gives a vivid picture of the early struggles of the paint industry and the place it occupies today. PI, 3, #12, 3/54, p. 31

1.2.12. Hamann reviews tendencies of development in the varnish industry. The author discusses the development of varnish raw materials, the next stage, modern plastics industry, and development in the application methods. PI, 4, #8, 11/54, p. 33

1.2.13. Ruggeri reviews the 1954 literature of the paint industry. This review offers a "bird's-eye" view of the industry from which to properly evaluate new developments and trends for direct use in daily work. The material is divided into 51 chapters grouped under 14 sections. PVP, 45, #2 (Part II), 2/55, p. 10

1.2.14. Fernald reports on the national survey of consumer painting habits. This survey was done by the control panel technique which differs from the house-to-house doorbell interviewing method in that questionaires were submitted to forty panels each of 1000 homes that had organized or signed up. POCR, 117, #24, 12/2/54, p. 27

1.2.15. The Paint, Oil & Chemical Review present Part I of their review of the paint industry. This part I includes: forward look, economics, thixotropic paints, latex paints-polyvinyl acetate, acrylic emulsions, other emulsions, and corrosion resistant paints. POCR, 118, #2, 1/27/55, p. 9

1.2.16. The Paint, Oil & Chemical Review continues its review of the paint industry. This second part includes automotive finishes, silicone-based paints, and epoxy resin finishes. POCR, 118, #3, 2/10/55, p. 20

1.2.17. The Paint, Oil & Chemical Review concludes its review of the paint industry. This third part includes alkyd resins, fire-retardant paints, exterior house paints, and Miscellaneous (including vinyltoluene, safflower oil, hydrocarbon-based oils, anti-condensation paint, "Hypalon", "Do-it-yourself" gadgets). POCR, 118, #4, 2/24/55, p. 17

1.2.18. Scofield reviews the developments in the paint field covering coatings, service testing, fire-retardant and latex paints, and miscellaneous items. 148 references are cited. IEC, 46, #10, 10/54, p. 2108

1.2.19. Silberberg & Kuhn studied the size and shape of droplets of demixing polymer solutions in a field of flow. The phases which are formed at 22°C when a solution containing 1.1% polystyrene and 1.7% ethylcellulose is made in benzene, are characterized by having a low interfacial tension ($\leqq 10^{-3}$ erg/cm.^{2}), which permits droplets of the one phase in the other to be easily deformed and disrupted in a field of flow. It was found that at intermediate velocity gradients very small and extremely elongated droplets are stable and that, at a given temperature, the phase separation can be reversed by raising the velocity gradient above a definite value. A full discussion of the observations is given. The superposition of break-up and recombination is responsible for the existance in practice of inherently unstable drop shapes. JPS, 13, #68, 2/54, p. 21.

1.2.20. Fuller reviews the use of agricultural products in surface coatings. Oils, lecithin, fatty alcohols, terpenes are some of the products discussed. APJ, 39, #22, 2/14/55, p. 70.

1.2.21. Brazelle reviews color trends during 1954-55. The growing trend is to pink. APJ, 39, #33, 5/2/55, p. 80.

1.2.22. Skett discusses the functions, and operations of the New York Club's Technical Committee. The Technical Committee has more participants in its 13 sub-committees than 50% of the Clubs of the Federation have members. The advisory sub-committee, support from "B" members, meetings,

new problems, and opportunities for participants are discussed. OD, 27, #364, 5/55, p. 256.

1.2.23. Barry presents a raw materials survey and forecast for 1954. CPVM, 28, #7, 7/54, p.18.

1.2.24. Barry presents a raw materials survey based on information gathered from the chief manufacturers and suppliers of raw materials for the Canadian protective coatings industry and is a condensation of their opinions with regard to their individual positions over the first six months of 1955. CPVM, 29, #1, 1/55, p. 4.

1.2.25. Farr reviews the need for more science in paint technology. The paint industry must not rely on the chemical industry and pure research institutions for all its developments. It must develop more basic research. CPVM, 29, #4, 4/55, p. 24.

1.2.26. Mukherjea reviews new trends in finishing and decoration in Germany. PI, 4, #9, 12/54, p. 40.

1.2.27. Swain reviews the industrial evolution of the paint industry. He traces the growth of the industry and reviews basic developments, pigment field, oil and resins, polyester possibilities, and the need for more technologists. OD, 27, #366, 7/55, p. 476.

1.2.28. Preuss reviews advances in the organic finishing industry. Includes: industrial expansion, government activities, surface preparation and cleaning, advances in application methods, new raw materials, progress in finishes, special purpose coatings, decorative finishes, miscellaneous products, testing, and safety and health. OF, 16, #1, 1/55, p. 6.

1.2.29. Berryman discusses the effective use of a technical library. JOCCA, 38, #3, 3/55, p. 134.

1.2.30. Rebate discusses multilingual glossaries. This article is substantialy an address which the author gave to the Committee on Terminology of the Organic Coatings Division of the International Union of Pure and Applied Chemistry. JOCCA, 38, #6, 6/55, p. 311

1.2.31. The small unit is profitable, but increasing scale of production does not always increase profitability. This is one of the conclusions of Wooder, who, in the first part of his article, discusses the general statistics concerning the whole industry. PM, 25, #1, 1/55, p. 20

1.2.32. The advances in the plant and equipment of the industry and the increasing uses of mechanical methods have a profound effect on the economics of production. In this second part of his article, Wooder discusses these factors together with the influence of design of the factory and many other economic aspects of manufacture. PM, 25, #2, 2/55, p. 49

1.2.33. The moderate-sized production unit with from 30—50 employees is potentially as profitable as the largest units with several hundreds on their payrolls. This is one of the conclusions of Wooder in this third (last) part of his article. He indicates some of the advantages and disadvantages connected with size of establishment, and gives an appraisal of integration. PM, 25, #4, 4/55, p. 135

1.2.34. Wooder reviews the paint and varnish industry in Europe. The tendency is for each country to become self-supporting. PM, 25, #7, 7/55, p. 265

1.2.35. Foy discusses the paper work involved in the manufacture of paint. This is an unwanted and often neglected chore which results in poor record keeping, erratic production, costly delays, and often in poor product control. OD, 27, #367, 8/55, p. 508

1.2.36. There is "no royal road to the application of research" says Jordan in discussing the application of research results to industrial processes. PT, 19, #208, 1/55, p. 10

1.2.37. Long presents part I of "Using Creative Imagination in Coatings", based on the J. J. Mattiello Lecture for 1954 presented at the Federation of Paint & Varnish Production Clubs Convention in Chicago, in 1954. The paper was first printed in the Federation Official Digest. (See item #1.2.3) CPVM, 29, #2, 2/55, p. 16

1.2.38. Long presents part II of "Using Creative Imagination in Coatings" based on the J. J. Mattiello Lecture for 1954 presented at the Federation of Paint & Varnish Production Clubs Convention in Chicago, in 1954. The paper was first printed in the Federation Official Digest. (See item #1.2.3) CPVM, 29, #3, 3/55, p. 30

1.2.39. Burrell reviews paints in 1954. Sales divided 60% for trade and 40% for industrial uses. Improvements included exterior latex paints and new vehicles. CEN, 33, #1, 1/3/55, p. 20

1.2.40. Cogshall discusses maintenance painting economics. PIM, 70, #4, 4/55, p. 10

1.2.41. Sarin reviews recent developments in surface coating. PI, 5, #5, 8/55, p. 36.

1.3.1. Employers are becoming leery of the narrow specialist. They need all-round young men who have sufficient talent to take over the managerial jobs. Here is an article which shows how to determine whether you are fit to be an executive. OD, 26, #357, 10/54, p. 974.

1.3.2. Fair discusses fatigue reduction in the paint plant. The general causes of fatigue are:

1. poor emotional adjustment
2. deficient bodily conditions
3. improper environmental forces

The importance of reducing fatigue is reviewed. APJ, 39, #7, 11/1/54, p. 58.

1.3.3. Fair discusses how reduced absenteeism builds profits and how absenteeism can be cut down. APJ, 39, #14, 12/20/54, p. 56.

1.3.4. Fair discusses the trend towards more women on the paint plant staff. APJ, 39, #48, 8/15/55, p. 34

1.3.5. Arnold discusses secrecy in the paint industry. The disadvantages of secrecy, how it retards science, and keeping the wrong secrets are reviewed. PT, 18, #206, 11/54, p. 93

1.3.6. Fair discusses how to handle the "problem employee". APJ, 39, #52, 9/12/55, p. 88

1.3.7. Mounce & Stevens discuss the foreman and workman's compensation law. They cover the following phases: jurisdiction adopting workmen's compensation law, theory underlying workmen's compensation legislation, types of workmen's compensation laws, amount and period of benefits, types of benefits, security for payment of benefits, who pays the costs, how workmen's compensation laws are administered, and

appeal to the courts. APJ, 40, #1, 9/19/55, p. 36

1.3.8. Mounce & Stevens discuss the legal aspects of the employer-employee relationship. APJ 40, #2, 9/26/55, p. 42

1.4.1. Stevens discusses paint manufacturers and the Federal Trade Commission. The F. T. C. though originally created to prevent price-fixing agreements, boycotts, combinations in restraint of trade, and other unfair methods of competition, was amended and given jurisdiction over false advertising of a wide variety of subjects, thus conferring upon it the authority over unfit and deceptive acts and practices. A number of sections of the laws under which the FTC operates are cited. APJ, 39, #7, 11/1/54, p. 20.

1.4.2. Mounce & Stevens discuss legal points for paint company executives. The following are reviewed:

1. Contract Law
    a. Mutual Assent
    b. Capacity of the Parties to contract
    c. Consideration
    d. Legality of Subject Matter
2. Agency Law
    a. Authority of the Agent
3. The Law of Sales

APJ, 39, #8, 11/8/54, p. 76.

1.4.3. Mounce & Stevens discuss how the uniform sales act affects the paint company. The article reviews the purposes of the uniform sales act, your contract, warranties, do warranties run with the goods?, remedies for breach of warranty, when does title pass, rights of unpaid seller, stoppage in transit, and other points for paint executives. APJ, 39, #13, 12/13/54, p. 42.

1.4.4. Mounce & Stevens present part one of a 2 part article describing the legal aspects of industry. This part discusses:

1. The partnership as a type for organizing a paint business
2. What is a partnership
3. How to determine a partnership
4. Advantage of a paint business partnership
5. Disadvantages of a paint business partnership
6. Creation of a paint business partnership
7. What is paint business partnership property
8. Property rights of paint business partners
9. Assignment of partner's interest
10. Relationship between paint business partners
11. Duties of partners in a paint business
12. Paint business partners relationship with third persons
13. Liabilities of paint business partners
14. Creditors' rights to a paint business partnership
15. How to dissolve your paint business partnership

APJ, 39, #31, 4/18/55, p. 84.

1.4.5. Chanda discusses the sudden imposition of an excise duty on the paint industry in India. PI, 5, #1, 4/55, p. 53.

1.4.6. Whyte discusses trade marks and spurious goods. The importance of trade marks is especially brought out in a country where many customers are illiterate as in India. PI, 5, #1, 4/55, p. 61.

1.4.7. Mounce & Stevens present part II of their article on the legal aspects of a paint corporation. They discuss what a corporation is, the chief characteristics, the Uniform Business Corporation Act, creation of a paint corporation, organizing and financing the paint corporation, managing the paint corporation, liabilities of paint directors and paint officers, contract (tort) liability, and other points. APJ, 39, #44, 7/18/55, p. 68

cf:
1.3.7
1.3.8
22.1.5
26.4.7
37.9.3
38.7.8

1.5.1. Gminder reviewing the National Paint Salesmen's Association, states that it is good but needs more "Bees". More new member clubs, more new members in existing clubs, more youth, more ideas, more teamwork with N.P.V. & L.A. are needed. APJ, 39, #27, 3/21/55, p. 40.

1.5.2. Sayles discusses selling surface coatings through sample distribution. Paints covered include, the sample, sample labeling, basis for sample distribution, successful sample distribution, the sample data sheet, new product modification, advertising new products, sample follow-up, extent of sample distribution, sample price, sample follow-up procedure, and visit by technical service representative. OD, 27, #362, 3/55, p. 174.

1.5.3. Wyart & Hecht describe how well equipped labs and expert chemists must work with the salesmen to satisfy established or potential customers. The type of laboratory needed is described, and a specific example showing how the raw material supplier helped the prospective customer is presented. CPVM, 28, #8, 8/54, p. 10.

1.5.4. "Paint Power and How to Sell It" and a complete correspondence course in English and French at nominal cost has been announced by the National Paint Power Committee set up under the auspices of the Canadian Paint, Varnish and Lacquer Association. CPVM, 28, #9, 9/54, p. 36.

1.5.5. Lindsay describes how you can benefit from "Paint Power." A man who has long been prominent in the paint industry, he explains the benefits it offers to serious seekers. CPVM, 28, #9, 9/54, p. 48.

1.5.6. Bernard discusses the "big plus value" in selling finishes. The industrial finish salesman sells: performance, quality, ease of application, end result, service, price, plus(?). This big plus is building the confidence of the buyer. IF, 31, #9, 7/55, p. 28

1.5.7. Reed discusses changes in the market and how to adjust with the changes. PIM, 69, #11, 11/54, p. 13

1.5.8. Lawyer describes procedures for training industrial salesmen. PIM, 70, #7, 7/55, p. 15

cf:
30.4.1

CHAPTER 2

GENERAL RESINS

2.1.1. Kudva discusses the position of synthetic resins in India. Both molding resins and synthetic resins in the coating industry are reviewed. Included are alkyd resins, phenolic resins, styrene-butadiene copolymer latex and solid resins, acrylic resins, coumarone and indene resins, vinyl resins, polyvinyl acetate, polystyrene latex. PI, 4, # 1, 4/54, p. 67.

2.1.2. During the past five years there has been much speculation on the possible application of highly intense radiations to problems in the polymer field and an increasing volume of research on the possibilities in the synthesis of new polymers and the improvement of the physical properties of presently existing polymers. Gamma radiation offers some unique advantages as an initiating agent in that 1. initiation can be effected at low temperatures where heat-sensitive monomers can be polymerized, 2. polymerizations can be carried out in the solid state, and 3. polymers can be made with no contamination from catalyst fragment. Recent work has shown that the physical properties of polymers can be markedly altered by exposure to radiation fields and that a vulcanization type process takes place. In this paper the work completed is reviewed, by Ballantine, and the industrial potential of intense radiation fields is evaluated. The types and characteristics of various sources of intense radiation that now exist or may exist in the future are discussed. MP, 32, #3, 11/54, p. 131.

2.1.3. Katchalsky & Miller investigated six amphoteric copolymers of different compositions of 2-vinylpyridene and methacrylic acid. The specific viscosities of the copolymer solutions exhibit a pronounced minimum at the isoelectric point and the spectrometric titration of the pyridinium groups shows a pronounced jump in pH at the isolectric degree of ionization. A theory of the polyamphylyte behavior, based on the shape changes of the macromolecules and the field energy of the ionized groups is developed and compares satisfactorily with the experimental results. The theory permits the evaluation of the intrinsic dissociation constants of the monomeric units and the determination of the isoelectric points from copolymer composition. JPS, 13, #68, 2/54, p. 57.

2.1.4. Katchalsky, et al, investigated the electrolytic dissociation of several polymeric acids and bases in aqueous solutions. The potentiometric behavior is well described by the following equations:

For poly acids:

$$pH = pK_0 - \log \frac{1-\alpha}{\alpha} + 0.4343 \frac{\Sigma \Psi_0}{kT}$$

For polybases:

$$pH = pK_0 - \log \frac{\beta}{1-\beta} - 0.4343 \frac{\Sigma \Psi_0}{kT}$$

pK_0 is the intrinsic dissociation constant of the nomomeric unit, α and β are the degrees of ionization of the polyacid and polybase respectively, and Ψ_0 is the electrostatic surface potential of the polyion. JPS, 13, #68, 2/54, p. 69.

2.1.5. Frisch & Stannett have modified the sorption isotherms proposed by Bauer. First the theory has been extended to apply to the sorption behavior of cross-linked polymers. Second the effect on the sorption isotherm of a concentration dependent heat of dilution has been investigated. Both these corrections may lead to the appearance of a two-valued sorption isotherm. JPS, 13, #68, 2/54, p. 131.

2.1.6. Bobalek reviews recent developments in condensation polymers for paint vehicles. Developments in alkyd resins, silicone-alkyds, polyurethane resins, "methylon" resins, and epoxy resins are included. OD, 27, #363, 4/55, p. 220.

2.1.7. Fish reviews some new raw materials, including emulsions, flat alkyds, epoxy resins, etc. PT, 18, #205, 10/54, p. 51.

2.1.8. Kapur reviews recent developments in plastics. PT, 5, #4, 7/55, p. 13.

2.1.9. Ross & Schwarz studied the polymerization of o-p-toluylbenzoic acid. In both polyphosphoric acid and perfluorobutyric anhydride, o-p-toluylbenzoic acid reacts to give low molecular weight, red polymers. A structure is proposed for the polymer. JACS, 77, #11, 6/5/55, p. 3020.

2.1.10. Winslow, et al, studied odd electrons in polymer molecules. Two series of pryolytic derivatives, from polyvinylidene chloride and pre-oxidized polydivinylbenzene, exhibited para-magnetic resonance absorption. Close correlations were observed among composition, semiconductivity and odd electron concentration of these residues, and also of pure dihydrogen phthalocyanine. Their properties presumably result from extensive conjunction in a dense, rigid carbon-carbon primary valence bond mesh. The low energies seemingly involved in providing conduction carriers lead to suggestions about electron movement in aromatic compounds. JACS, 77, #18, 9/20/55, p. 4751.

Look to BAKELITE for the stars of '56

to team up with these stars of '55

LATEX WC-130 WC-130, a BAKELITE Brand vinyl acetate resin latex was highlighted as a superior vehicle for interior wall sealers and coatings. It is a smooth, stable, fast-filming aqueous dispersion. It features marked resistance to foaming and unusual electrolytic tolerance. Paints and coatings based on WC-130 provide superior color, toughness, and resistance to alkalis and cleaning compounds.

"COLD-MIX" VARNISHES Definitely a high spot of the year was the enthusiastic acceptance of the "cold-mix" method for preparing durable floor varnishes, exteriors, primers and enamels, primer vehicles for magnesium and aluminum, spar varnishes, baking primers and enamel vehicles, and for upgrading alkyd and ester gum and modified phenol varnishes. This exclusive method is based on BAKELITE Brand Phenolic Resin BR-9400. Cold-Mix coatings show exceptionally fast surface dry, through dry, and produce hard, resistant films. They offer formulators top quality with the greatest possible formulation flexibility with a minimum inventory.

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation*

UCC

30 East 42nd Street, New York 17, N. Y.

But more than these: In 1955, BAKELITE introduced UF-1952 wall sealer based on WC-130 . . . highly intriguing test data on the use of these latex-based paints for exterior use . . . new data on hot spray techniques . . . simplified production of latex paints by post-plasticization . . . and other valuable contributions. And there are more to come in 1956. For your information and assistance, there are many Technical Bulletins that provide helpful data and formulations. Write for them to Dept. MZ-165

Look to BAKELITE for the newest and latest in '56

BAKELITE
BRAND
RESINS for COATINGS

The term BAKELITE and the Trefoil Symbol are registered trade marks of UCC

2.1.11. Fox & Loshaek discuss the influence of molecular weight and degree of cross-linking on the specific volume and glass temperature of polymers. JPS, 15, #80, 2/55, p. 371.

2.1.12. In the manufacture of a resinous product of the ether type by condensation of a dihydric phenol and a difunctional halohydrin in alkaline media wherein the molar ratio of said phenol to said halohydrin is within the ratios of 1:1.1 to 1:1.5, the improvement which comprises adding to the resinous phase subsequent to the removal of water-soluble salts and prior to the final removal of volatiles therefrom by distillation, a catalytic quantity but not more than 1.25% based on the halohydrin content of said resin forming constituents of an acid-reactive phosphorus-containing compound exclusive of the inorganic salts of phosphorus. USP 2,686,771.

2.1.13. A process for preparing fungi and bacteria resistant vinyl halide-containing polymeric compositions which comprises incorporating into a vinyl halide-containing polymer in which more than 50% by weight is made from a vinyl halide a substantially homogeneous composition obtained by heating a mixture comprising a plasticizer for said resin, the condensation product of toluene-sulfonamide and formaldehyde and a minor but effective amount of copper 8-quinolinolate, the amount of the condensation product of toluenesulfonamide and formaldehyde being sufficient to compatibilize the copper 8-quinolinolate in the resin composition. USP 2,689,-838.

2.1.14. A process for the preparation of silica-containing polymeric compositions which comprises heating and polymerizing at a temperature of 40° to 150°C. a polymerizable monoethylenically unsaturated monomer containing a single ethylenic double bond as the sole aliphatic carbon-to-carbon unsaturation in admixture with dried peroxysilica as the sole polymerization catalyst, the weight ratio of said peroxysilica to said polymerizable monoethylenically unsaturated monomer being 1:3 to 0.10:9.9. USP 2,692,868.

cf:
25.5.1
32.2.10
38.7.7
38.8.4

2.2.1. Vinyltoluene oil copolymers and their use in flat wall paints are discussed by Cipriano and Henson. Vinyltoluene, combined with a small amount of divinylbenzene, has demonstrated itself in laboratory data to be a valuable raw material for the production of high grade, non-penetrating flat wall vehicles. The coatings possibilities are many; the details and refinements involved in the new vehicle field are still in the "growing up" stage. OD, 26, #357, 10/54, p. 951.

2.2.2. Burrell reviews vehicle problems. There is a need for custom alkyds in small volume, low-cost epoxies, and heat stable vinyls. Typical finishing problems and important vehicle needs are discussed. PVP, 44, #11, 11/54, p. 68.

2.2.3. Contos describes some novel properties of polyamide alkyd gels. These are reversible jells which undergo changes in apparent viscosity with mixing, leading to the formulation of thixotropic no-drip paints. APJ, 39, #36, 5/23/55, p. 72.

2.2.4. Tess discusses oleoresinous varnishes from epoxy resins and drying oils. Epoxy resins derived from epichlorohydrin and Bispherol-A have been converted into air-drying varnishes by cooking with vegetable oils. Compared to varnishes derived from ordinary varnish resins, the epoxy resin-oil varnishes have faster bodying rate, higher viscosity, lighter color, and lower acid number. Although the epoxy resin-oil varnishes dry slowly and yield soft films like many other soft oil varnishes, they have remarkably good exterior durability in clear films upon wood, and in pigmented films have good chalk resistance. The varnishes are quite different from epoxy esters derived from epoxy resins and fatty acids. These latter products dry rapidly and yield hard, flexible films possessing good abrasion and chemical resistance. JAOCS, 32, #5, 5/55, p. 291.

2.2.5. Richardson discusses the "cold mix" technique for preparing varnishes. While it is not expected that the "cold mix" technique will supplant that of conventional varnish making it is expected that it will supplement standard techniques by offering increased flexibility in formulation. PVP, 45, #9, 8/55, p. 25.

cf:
23.8.2

CHAPTER 3

ACRYLICS

3.1.1. Allyn reviews acrylic and methacrylic polymers. General properties, uses in industrial finishes, formulating techniques, acrylic emulsions, and future prospects are discussed. PVP, 44, #11, 11/54, p. 36.

3.1.2. Riddle discusses acrylic monomers in coating vehicles. The term "acrylic monomers" is used industrially for both acrylic and methacrylic acids and their derivatives including esters, amides, and nitriles. This paper deals with the esters which include the following commercially available esters:

Acrylates—methyl, ethyl, butyl, 2-ethylhexyl

Methacrylates-methyl, ethyl, butyl, hexyl, decyl-octyl, lauryl, stearyl,

APJ, 39, #27, 3/21/55, p.46.

3.1.3. The sorption of water by a series of methyl methacrylate polymers has been studied by Brauer & Sweeney, as a function of temperature and degree of polymerization. Sorption is nearly independent of temperature from 0 to 60°C. Thin specimens ready a steady state value within a short time. In the vicinity of the glass temperature, Tg, the sorption of water increases rapidly. The polymers show large weight increases on exposure to water above Tg and steady state sorption values are not obtained.

Sorption is markedly affected by the molecular weight of the polymer above Tg. Specimens of larger molecular weight show smaller weight increases. Sorption of water by the polymers is reversible. Degradation takes place during molding of 150°C. and limited hydrolysis occurs on exposure to boiling water; both treatments lead to increased sorption of water. The increase in sorption of water above Tg is thought to be due to the less rigid linkage in the polymer chains and an expansion of the structure which allows water to permeate more readily into the material. MP, 32, #9, 5/55, p. 138.

3.1.4. Trementozzi examined four sharp fractions of polymethacrylic acid, by light scattering and osmotic pressure measurements as a function of concentration of polyelectolyte and simple, supporting electrolyte. An appreciable Donnan membrane effect is demonstrated for the case of pure ethanol as the solvent. In the presence of 0.125-0.250M LiBr, the Donnan effect is shown to be eliminated. Use of pure ethanol instead of alcoholic LiBr as the solvent has little if any effect on the molecular weight determined from angular light scattering measurements. The molecular weights by the two methods are found to be in excellent agreement over a tenfold range. The second virial coefficients and μ values are found to be in accord also. JACS, 76, #21, 11/5/54, p. 5273.

3.1.5. Kice studied kinetically by a dilatometric method the effect of nine compounds on the 2,2′—azo-bis-isobutyronitrile-catalyzed polymerization of methyl methacrylate. Where possible the data were analyzed using a new equation, derived from a reasonable kinetic scheme, which permits a quantitative evaluation of the extent to which wastage of inhibitor takes place through "copolymerization." JACS, 76, #24, 12/20/54, p. 6274.

3.1.6. In this study, by Greenberg & Alfrey, of side chain crystallinity, methacrylate and a cryl ate monomers, with n-alkyl groups containing from 12 to 18 carbon atoms, were synthesized, polymerized, and copolymerized; dilatometric measurements were made on these polymers to determine the changes in specific volume with temperature and time; spacings were obtained from Debye-Scherrer patterns taken at small and wide angles. The following results were noted: the specific volume-temperature plots were S-shaped, typical of first-order transitions; crystallization was rapid and accompanied by very little supercooling; melting ranges were short except for mixed long chain copolymers; long and short spacings were found in the x-ray patterns. The melting ranges of the polymers did not depend on the temperature of the cooling bath. JACS, 76, #24, 12/20/54, p. 6280.

3.1.7. A new angular dissymmetry light scattering instrument for molecular weight measurements was used, by Billmeyer and DeThan, in studying the molecular characteristics of polymethyl methacrylates of molecular weights between 35,000 and 10,000,000. Viscosity-molecular weight relationships in butanone and acetone agreed within experimental error with those reported in the literature. Similar relations in chloroform and ethylene dichloride are not in good agreement with other results, primarily because shear rate corrections were omitted. JACS, 77, #18, 9/20/55, p. 4763.

3.1.8. Majury discusses the polymerization of methyl methacrylate by pulses of high-energy electrons. JPS, 15, #79, 1/55, p. 297.

3.1.9. Loshaek determined glass

temperatures of copolymers of methyl methacrylate and glycol dimethacrylates. Glycol dimethacrylates used included:

ethylene glycol dimethacrylate

decamethylene glycol dimethacrylate

2-ethyl-2 butylpropanediol-1, 3-dimethacrylate

2, 2-dimethylpropanediol-1, 3-dimethacrylate
JPS, 15, #80, 2/55, p. 391.

3.1.10. Schulz, et al, determined the chain transfer of polymethyl methacrylate in the polymerization of methyl methacrylate and styrene by adding polymer of low chain length to the polymerizing system. This has no influence on the rate of polymerization, but the degree of polymerization of the growing polymer is lowered. JPS, 17, #83, 5/55, p. 45.

3.1.11. Chinai, et al, studied the dilute solution properties of polymethyl methacrylate by viscosity and light scattering. JPS, 17, #85, 7/55, p. 391.

3.1.12. The Rohm & Haas Company issued 8-page bulletin describing Acryloid B-66 (40%) and 4-page bulletin describing Acryloid B-66 (100%).

---

cf:
2.1.1
2.1.3
7.1.1
7.1.2
7.1.3
7.1.4
7.1.5
7.1.6
25.7.7
27.1.8
27.17.4
32.1.4
32.2.18
32.2.19
32.2.22
38.1.12
38.2.27
38.8.3

Manufacturers:
American Cyanamid Company
The Borden Company, Chem. Div. Polyco Dept.
E. I. Dupont de Nemours & Co., Inc.
Rohm & Haas Company

CHAPTER 4

ALKYDS

4.1.1. Thomas discusses the present status of alkyd and epoxy resins in the coatings industry. Since 1927, alkyd resins have seen a tremendous growth mainly because they exhibit extremely fast dry coupled with superior toughness and durability.

The epoxy resins exhibit some very unusual and outstanding properties which include extreme chemical resistance, adhesion to a wide variety of surfaces and extreme flexibility, particularly at reduced temperatures. They exhibit excellent heat resistance and in general exhibit very low permeability to moisture and other vapors. Since 1947 when they were marketed after a considerable period of research and development, they have come a long way. OD, 26, #357, 10/54, p. 917.

4.1.2. The Northwestern Club has developed a nomograph for alkyd resin formulation. This paper extends the calculations of Burrell to include not only alkyds made from fatty acids but also alkyds based on oils or mixtures of oils and various types of acids. The calculations also take into consideration the use of excess amounts of polyhydric alcohols. The nomograph simplifies and in many cases eliminates, calculations. OD, 26, #358, 11/54, p. 1062

4.1.3. Bosch, et al, investigated the effect of pigmentation upon the stress-strain properties of paint films and of emulsification on these properties of alkyd films. Conclusions are as follows:

1. addition of pigment increases tensile strength but decreases the elongation of the film.
2. degree of influence depends mainly upon the chemical nature of the pigment
3. replacing a portion of ZnO by talc decreased the tensile strength but did not increase the distensibility of the film
4. shape of the pigment influenced properties but no conclusions could be drawn
5. emulsification affected the properties. The tensile strength at the breaking point was decreased. The influence was greater with oil-in-water than with water-in-oil emulsions.
6. ageing of dried alkyd films and of dried alkyd emulsion films increased the tensile strength, at least up to 30 days.
7. The influence of emulsification upon stress-strain properties was more apparent in case the tensile strength of the alkyd itself was greater.

OD, 26, #359, 12/54, p. 1219.

4.1.4. Wilson & Robson studied the polymer distribution in drying-oil modified alkyd resins. Conclusions are as follows:

a. In the alkyd system there is a wide distribution of polymer sizes from low molecular weights (non-film forming) to very high molecular weights (approaching the gel stage).
b. Differences in composition of the alcoholysis product are not completely nullified by ester interchange processes occuring in the esterification stage of the alkyd process, and high free glycerol content at the time of addition of the phthalic anhydride leads to an increase in the amount of very high molecular weight material in the resin product.
c. Temperature exerts the most important influence on formation of very high molecular weight material in a resin of given formulation. A high alcoholysis temperature or the pre-polymerization of the oil, both lead to the formation of polymer species approaching gel stage in complexity.
d. These highly complex polymers appear to lead to improved gloss retention in clear films, but in pigmented systems, they can be responsible for loss of gloss and instability on storage. The oil length of the alkyd appears to govern the extent of these effects.
e. The highly complex polymers reduce the wrinkling tendency of long oil alkyds.
f. It seems desirable to avoid either very low or very high molecular weight material. Low molecular weight fractions, capable of drying to yield a rather soft film may, however, be a very necessary part of an alkyd system, in acting as plasticizers for the more highly polymerized material present.

OD, 27, #361, 2/55, p. 111

4.1.5. Gardner reviews the polyesters, or more popularly called alkyds. Eight classes of polyesters can be distinguished as follows:

a. Resins based upon phthalic anhydride
b. Resins based upon maleic anhydride
c. Resin plasticizers derived from long chain polyesters
d. Polymers of simple unsaturated esters
e. Copolymers of unsaturated polyesters and vinyl compounds

1886 TFW 1956

70 YEARS OF KNOW-HOW!

CONTROLLED QUALITY! RESEARCH!

Today — as in 1886 — the uncompromising goal of the T. F. Washburn Company is to provide the paint and varnish industry with the highest quality, most scientifically compounded vehicles and components which skilled technicians and modern methods can produce.

Sims O. Smith

President

go into

TFW VEHICLES

and into the most revolutionary development in paint history!

BURNOK*

THIXOTROPIC VEHICLES

for all types of Jelled alkyd Paints

BURNOK ...it's Magic! ALKYD NON DRIP type JELLED PAINT

For your paint and varnish requirements . . .

TFW VEHICLES

- Alkyds
- Varnishes
- Japans
- Epoxies

. . . From a single drum to tank trucks.

*PATENTED (2,663,649) ALKYD GEL VEHICLE of the T. F. WASHBURN CO.

TFW **T. F. WASHBURN** *Company*

Manufacturers of Quality Paint Components and Floor Finishing and Maintenance Products since 1886

2244 ELSTON AVENUE • CHICAGO 14, ILLINOIS • ALbany 2-0600

f. Polyesters—urethanes
g. Polyester modified silicones
h. Other polyesters.

This article discusses phthalic alkyds, maleic alkyds, resin-plasticizers, allyl resins, unsaturated polyester copolymers, polyester-urethane resins, silicone alkyds, and other polyesters.
APJ, 39, #5, 10/18/54, p. 70

4.1.6. Bragdon presents part III of "Glycerine Alkyds Tailored to Need". This part considers some of the present and probable future trends in the manufacture and use of glycerine alkyds, and methods for their evaluation. APJ, 39, #5, 10/18/54, p. 86.

4.1.7. Ginsler & Igdaloff review alkyds. Used at an ever increasing rate, alkyd baking enamels, formulated with specific properties to meet end-use requirements, find their way on countless metal products. Alkyd components are listed under the following five types—polyfunctional acids, polyhydric alcohols, monofunctional acids and vegetable oils, monofunctional alcohols, and olefinic modifiers. New chemicals spur progress, engineering spurs progress, the modern alkyd resin plant, trends in process equipment, quality control, and summary are included. PVP, 44, #11, 11/54, p. 38

4.1.8. Hind reviews glycerine resin research. He discusses why research on glycerine alkyds? One big reason is to see that glycerine is honestly evaluated among other polyols, as glycerine alkyds have much to offer. Also discussed are comparing esterification rates, role of impurities and β-hydroxyl group. A summary is presented. PVP, 45, #3, 3/55, p. 30

4.1.9. Niehaus reviews the alkyd resins in the paint and varnish industry. Introduced in India not many years ago these are gaining ground rapidly as they solve many of the formulators' problems; and their use means quicker work, bigger out-turn. Long-oil-alkyds, medium-oil-alkyds, short oil-alkyds, and styrenated alkyd resins are included. PI, 4, #1, 4/54, p.73

4.1.10. Wangsness, et al, (Northwestern Club) have developed a nomograph for use with alkyd resin formulation. The nomograph is of value in calculating or checking new alkyd formulations or checking existing combinations. POCR, 117, #24, 12/2/54, p. 80

4.1.11. Johnston and Fitzgerald report on a study of yellowing and gloss retention of pure oil esters and alkyds.

This work aimed at correlating the rate and extent of yellowing in films of drying oils and alkyds with the initial structure of the material. This was done by measuring the color development on aging in both clear and pigmented films of 23 drying oils and alkyds whose purity and composition were known. Gloss measurements were made on the pigmented films. Complete numerical data are given and correlations with structure have been drawn where possible. OD, 27, #364, 5/55, p. 280

4.1.12. Park presents graphical results of water-resistance tests on various air dry alkyd resin formulations. Alkyds included in this study were all based on linseed oil (50% oil length except in two cases) with various different polyols. CPVM, 29, #5, 5/55, p. 30

4.1.13. Tawn discussed the nature of some of the problems involved in the fundamental study of alkyd resins. After examining these problems, he showed how they appeared against the wider background of general polymer science and reported work now being carried out. PM, 25, #4, 4/55, p. 151

4.1.14. Prakash, et al, reviews air-drying oil-modified alkyd resins. He discusses the chemistry of the alkyds, linseed-oil-modified alkyds, and castor-oil-modified alkyds. PT, 18, #205, 10/54, p. 55

4.1.15. Seaborne has developed a series of nomograms applicable to alkyd manufacture. These nomograms cover the formulation of oil-modified alkyds, total cost of raw materials, cost of triglyceride (fatty acid process), and the cost of thinned medium. PT, 19, #208, 1/55, p. 6

4.1.16. Bock & Anderson prepared and evaluated linear polyesters derived from vanillic acid, which is potentially available from lignin. Vanillic acid was converted to dibasic acids which were then esterified with ehtylene glycol and condensed to linear polyesters. The polyesters were evaluated as fibers. JPS, 17, #86, 8/55, p. 553.

4.1.17. The Rohm & Haas Company issued 4-page bulletin on Amberlac 292G and 7-page bulletin on Amberlac 292X, modified polyester resins in different solvents.

cf:
1.2.17
2.1.1
2.1.6
2.2.2
2.2.3
2.2.4
19.7.1
21.3.1
22.2.1
23.1.19
23.8.3
23.11.5
23.11.9
24.1.1
25.3.4
26.2.2
27.3.2
37.1.1
37.3.6
37.8.1
38.7.2
38.7.9
Manufacturers:
Adco Chemical Company
Alkydol Labs., Inc.
American Alkyd Industries
American Cyanamid Company
Archer-Daniels-Midland Company
Atlas Powder Company
Cargill, Inc.
Crownoil Chemical Co., Inc.
Farnow, Inc.
France, Campbell & Darling, Inc.
Freeman Chemical Corp.
General Electric Company
Hercules Powder Company
Jones-Dabney Company
McCloskey Varnish Company
Plaskon, Barrett Div.,
Allied Chemical & Dye Corp.
Reichhold Chemicals, Inc.
Rohm & Haas Company
Schenectady Varnish Company
Fred'k. A. Stresen-Reuter, Inc.
The Thibaut & Walker Co., Inc.
T. F. Washburn Company

4.2.1. (No abstracts)

cf:
2.2.4
4.1.5
23.8.3
Manufacturers:
Alkydol Labs, Inc.
American Cyanamid Company
Archer-Daniels-Midland Company
Cargill, Inc.
France, Campbell & Darling, Inc.
Hercules Powder Company
Rohm & Haas Company
Schenectady Varnish Company

4.3.1. Alkyd-silicone varnishes were made, by Hiles et al, by reacting organoethoxypolysiloxane with alkyd resins having excess hydroxyl groups. A study of several of the important cooking and composition variables of the varnishes was made.

Enamels, pigmented with titanium dioxides, were prepared from the variables and evaluated. Prop-

erties such as gloss and color retention, craze life, and hardness are compared. Properties such as flexibility, impact resistance, alkali resistance, and toluene resistance are discussed.

The enamels, generally, were hard, brittle, and deficient in craze life. Their gloss and color retention at 400°F. was good. The toluene resistance of alkydsilicone enamels was excellent and the alkali resistance was good. The curing schedule of the enamels, 30 or more minutes at 400°F., was rather drastic, but curing could be accelerated by use of cobalt naphthenate or an acid catalyst such as n-butyl acid phosphate. IEC, 47, #7, 7/55, p. 1418

cf:
2.1.6
4.1.5

4.4.1. Schechter & Wynstra discuss the styrenation of alkyds with controlled maleic functionalities. Several alkyd composition factors —maleic content, degree of esterification, type of polyalcohol, and extent of oil modification—which are interdependent on one another were combined in one parameter, maleic functionality, which was then used to define the operable alkyd composition range for copolymer formation under a given set of conditions. IEC, 47, #8, 8/55, p. 1602

4.4.2. Reichhold Chemicals, Inc., issued Technical Bulletin SC-8 describing #4445-50 Styresol, a vinyl toluene modified alkyd.

cf:
2.2.4
4.1.9
23.1.25
38.7.4

Manufacturers:
American Cyanamid Company
Jones-Dabney Company
Reichhold Chemicals, Inc.

CHAPTER 5

CELLULOSE DERIVATIVES

5.1.1. Entrenched nitrocellulose is still one of the most important cellulose derivatives for the manufacture of lacquer finishes; recent use in one coat multi-color finishes demonstrates the versatility of this derivative; ethyl cellulose and cellulose acetate find use in specialized products. Ethyl cellulose, cellulose acetate, nitrocellulose and ethyl hydroxyethyl cellulose, lacquers prepared therefrom, and methods of application (cold spray, hot spray, and aerosol) are discussed. PVP, 44, #11, 11/54, p. 48

5.1.2. A film forming and drying composition comprising a solution of a cellulosic derivative selected from the group consisting of cellulose nitrate, lower cellulose aliphatic acylates and cellulose ethers containing from 2 to 7 carbon atoms in the etherifiying group, said cellulosic derivative having from 0.2 to 0.8 free hydroxyl groups per glucose unit, and an alkyl titanate containing from 1 to 12 carbon atoms per alkyl group in a solvent medium consisting essentially of a lower aliphatic liquid solvent having a boiling point substantially no higher than 155°C., and containing a compound having an alcohol radical. USP 2,686,133.

5.2.1. Newman presents some additional data on the melting of cellulose nitrate. The dilution effect due to unesterified hydroxyl groups is found to exert a profound effect on the melting point, lowering it by several hundred degrees. JPS, 13, #68, 2/54, p. 179

5.2.2. Caldwell & Creasy discuss the manufacture of various grades of industrial nitrocellulose, with special reference to the precautions taken to insure their suitability for use in lacquers. PM, 24, #12, 12/54, p. 435.

5.2.3. The theory and practice of nitration by "mixed acid" are discussed by Caldwell and Creasy, and the relationship between nitrogen content and acid strength indicated.

The displacement and mechanical nitration processes are described, and the theory and practice of stabilization by boiling discussed. Stabilization is also achieved by "kiering", a process employed for viscosity reduction, and continuous and batch kiers are described.

The manufacture of dense cellulose nitrate from wood pulp is described.

Dehydration of the water-wet cellulose nitrate is carried out with various alcohols and the spirit strength determined by the hydrocarbon test, while the quality of the cellulose nitrate is examined by means of critical test solvents. JOCCA, 38, #8, 8/55, p. 431.

5.2.4. Absorption of solvent and swelling by nitrocellulose fibers and films, in binary solvent-hexane mixtures of varying concentration and involving ketones, acetates, and phthalates, have been compared by Moore. Equilibrium is less rapidly attained by films. With solvents of smaller molecular size the equilibrium absorption of fibers and films, at a given concentration, is the same, suggesting that all regions of the nitrocellulose are accessible to such solvents. JPS, 15, #79, 1/55, p. 305.

5.2.5. Ultrasonic energy has often been shown to have a depolymerizing effect on polymeric materials. Thomas & Alexander, studying the ultrasonic degradation of cellulose nitrate, discuss the relation between initial and final average and distribution of degree of polymerization. JPS, 15, #80, 2/55, p. 361.

5.2.6. A film-spreading composition consisting essentially of nitrocellulose and liquid in which said nitrocellulose constitutes not more than about 20% by weight and said liquid constitutes the remainder and in which the liquid consists essentially of (1) a substantially non-volatile, water-insoluble plasticizer for said nitrocellulose, present in an amount of about 1/10 to ½ the weight of said nitrocellulose, (2) of substantially water-insoluble solvent selected from the class consisting of octyl acetate, ethyl buty acetate and ethyl amyl acetate in an amount equal to about 2 to 4 times the weight of the nitrocellulose, and (3) a solvent selected from the class consisting of ethyl acetate, cyclohexanone and methyl isobutyl ketone constituting the remainder.

A film-spreading composition consisting essentially in per cent by weight of nitrocellulose 10%, dioctyl phthalate 2.5%, octyl acetate 27.5%, and mesityl oxide 60%. USP 2,689,187.

5.2.7. A nitrocellulose coating composition comprising one part by weight of a soluble nitrocellulose and, as a plasticizer for the nitrocellulose, from about 0.1 to about 1.0 parts by weight of di (beta phenoxyethyl) diglycolate. USP 2,699,400.

cf:
5.1.1
22.4.3
27.7.6
27.17.3
37.11.2
38.7.8

Manufacturers:
American Cyanamid Company
E. I. dupont de Nemours & Co.

Hercules Powder Company
Monsanto Chemical Company

5.3.1. The cellulose acetate industry, based on the acetylation of cellulose with acetic anhydride using sulfuric acid catalyst, was established before the chemistry of the process was well understood.

Malm & Tanghe have studied the basic reactions of acetylation, deacetylation, sulfation, and desulfation have been studied individually. The nature of these reactions varies considerably between the acetylation step and the hydrolysis step of the process. All of the above reactions have been observed in the hydrolysis step, and all except deacetylation in the acetylation step.

There are distinct differences between the ractivity of the primary and secondary hydroxyls. The acetylation and sulfation reactions are reversible during the hydrolysis. IEC, 47, #5, 5/55, p. 995

5.3.2. Ward, et al, studied the alcoholysis and hydrolysis of cellulose triacetate in chloroform. Ethanolysis and methanolysis of cellulose triacetate in chloroform in the presence of benzenesulforic acid yielded a series of methyl and ethyl glucosides, respectively. Hydrolysis of cellulose triacetate in chloroform produced a water-soluble and highly dextrorotatory polysaccharide. JACS, 76, #23, 12/5/54, p. 6102

5.3.3. Bagley and Long studied two-stage sorption and desorption of organic vapors (acetone and methanol) in cellulose acetate films. JACS, 77, #8, 4/20/55, p. 2172.

5.3.4. Myles & Reiss discuss sorption of nitrogen dioxide by cellulose acetate. Sorption proceeds by a process of solution, diffusion, and reaction governed by Henry's law, Fick's law, and first order kinetics with respect to the consumption of NO_2. JPS, 15, #79, 1/55, p. 243.

5.3.5. Moore & Russel studied the swelling and absorption by cellulose acetate in binary solvent-hexane mixtures. JPS, 18, #87, 9/55, p. 63.

5.3.6. As a composition of matter, cellulose acetate and a plasticizer therefore, said plasticizer comprising from 10% to 35% by weight of the sum of cellulose acetate and plasticizer, wherein at least half of said plasticizer is a monophenyl ether of a polyethylene glycol containing from 4 to 6 oxyethylene groups and the balance is another solvent plasticizer for cellulose acetate, and wherein the said ether constitutes not more than 25% of the said sum. USP 2,697,046.

cf:
5.1.1.
27.17.3
32.1.5
37.8.2
37.11.1
37.11.2
38.7.6
Manufacturers:
Eastman Chemical Products, Inc.
Hercules Powder Company

5.4.1. Gearhart & Ball present part III of their paper on half-second cellulose acetate butyrate. This paper covers the preparation of test films, compatibility of plasticizers, effect of plasticizers on film properties (tensile strength, elongation, surface hardness, permanence, and low temperature flexibility), and integration of data. Half-second butyrate is compatible with virtually all types of plasticizers tested; hence, considerable latitude in formulation is possible. OD, 27, #361, 2/55, p. 83

5.4.2. Ball & Lee discuss cellulose acetate butyrate. Soluble in low cost solvent combinations, wide compatibility, inherent flexibility, and resistance to outdoor weathering are some of the important characteristics of this derivative. Four cellulose acetate butyrates produced by Eastman Chemical Products, Inc. are described; properties and plasticizer compatibility are presented. PVP, 44, #11, 11/54, p. 46

5.4.3. A rapid method for analysis of cellulose acetate butyrate based on the determination of saponification and hydroxyl values, is described by Kamath and Sourirajan, from which the acetyl and butyral contents are readily calculated. PI, 5, #1, 4/55, p. 77

5.4.4. Eastman Chemical Products, Inc., issued 42-page booklet describing properties and uses for half second butyrate—cellulose acetate butyrate.

cf:
27.17.3
Manufacturers:
Eastman Chemical Products, Inc.

5.5. (No abstracts)

cf:
1.2.19
5.1.1
27.7.6
27.17.3
Manufacturers:
Dow Chemical Company
Hercules Powder Company

5.6.1. Fujita & Homma discuss non-Newtonian viscosities in dilute aqueous solutions of sodium carboxymethylcellulose. JPS, 15, #79, 1/15, p. 277.

Manufacturers:
Hercules Powder Company
Wyandotte Chemicals Corp.

5.7.1. Greminger, et al, describe a new thermoplastic water-soluble synthetic gum. Chemical alteration of cellulose has produced this new modified methylcellulose, Methocel 2602, which combines many properties of the organo-soluble cellulose derivatives with the properties of the hydrophylic synthetic gums. This product is nonionic, surface active, thermogelling in aqueous solution, and can be formed by heat fabrication techniques normally possible only with plastic-type compounds. IEC, 47, #1, 1/55, p. 156

Manufacturers:
Dow Chemical Company

5.8. (No abstracts)

Manufacturers:
Carbide & Carbon Chemicals Division

5.9 (No abstracts)

cf:
5.1.1
Manufacturers:
Hercules Powder Company

CHAPTER 6

EPOXY RESINS

6.1.1. Hopper reviews epoxy resins. Range of properties such as adhesion, toughness, flexibility, chemical, solvent resistance are possible in epoxy-, phenolic, urea, melamine, fatty acids, polyfunctional amine combinations. Use with ureas and phenolics, epoxy resin esters, and amine cured systems are discussed. PVP, 44, #11, 11/54, p. 52

6.1.2. Luke reviews epoxide resins. The newly developed epoxide resins based on epichlorhydrin and diphenylolpropane are probably the most important contribution to resin technology since the introduction of alkyd finishes. Surface coatings based on these resins are now being manufactured in India and it is expected that usage will increase substantially in the next few year. PI, 4, #1, 4/54, p. 79

6.1.3. The manufacture of ethoxyline resins has made possible many new applications, especially in the metals and electrical fields. Other industries will also find much of interest in ethoxylines and this article describes its properties and applications in detail. PI, 4, #4, 7/54, p. 27

6.1.4. The Epon resins are well known today for their use in surface coatings. They are also known for their good adhesion and for their use in adhesives. These resins can, in addition, be used for making glass fiber laminates with unusually attractive properties. A description of such laminates together with a summary of how to prepare them is presented in this paper by Elam and Hopper. MP, 32, #2, 10/54, p. 141

6.1.5. Sussman reviews the processing of epoxy resins. The hardening reaction, rheological considerations, activating the resin, de-aeration, triggering the reaction, and compounding ingredients are discussed. MP, 32, #8, 4/55, p. 164

6.1.6. Nickles discusses surface coatings derived from "Epon" resins. The wide and rapid acceptance of epoxy resins in the protective coating industry is due to their versatility, their chemical resistance, adhesion, and flexibility since they combine in one resin the outstanding characteristics of many others. OD, 27, #362, 3/55, p. 185

6.1.7. Brenner & Singer describe epoxy-furane resin blends. The introduction of the furane resin lowers the cost without detracting appreciably from the properties. MM, 41, #6, 6/55, p. 102

6.1.8. Formo & Bolstad discuss the applications of epoxy resins in coatings, adhesives, castings, moldings, and foams. MP, 32, #11, 7/55, p. 99

6.1.9. Wheeler discusses the epoxide resins, nature and properties, and methods of use in coatings. Esterification, crosslinking with phenolic resins, crosslinking with amine resins, and crosslinking with amines are discussed, as well as modification of alkyds with epoxide resins and epoxide resin/isocyanate compositions. PT, 18, #207, 12/54, p. 131.

6.1.10. Bradley discusses some physical characteristics of epoxy resin films. PT, 19, #214, 7/55, p. 230.

6.1.11. Kronomeier discusses "Epon" resin finishes. These finishes fall into six groups as follows:

A. Unesterified (pure)
   1. Amine converted
   2. Urea converted
   3. Phenolic converted

B. Esterified (acid reacted)
   1. Unmodified
   2. Styrenated
   3. Modified

IF, 31, #11, 9/55, p. 46.

6.1.12. Dearborn, et al, discuss the acid acceleration of epoxide condensations. The addition of carboxylic acid to Epon 834-phthalic anhydride resins accelerates the rate of cure. The maximum thermal yield point corresponds to reaction of all the epoxide groups in the ratio of two anhydride carbonyls to one epoxide oxygen or of one acid carbonyl to one epoxide oxygen. JPS, 16, #82, 4/55, p. 201.

6.1.13. The process of producing complex epoxide resins which consists essentially of reacting diphenol with an excess of a chlorhydrin selected from the class which consists of epichlorhydrin and glycerol dichlorhydrin, the proportions of chlorhydrin to diphenol being in excess of 1:1 and not more than about 2:1, in the presence of caustic alkali, and continuing the reaction to produce a solid water-insoluble resinous product. USP 2,698,315.

6.1.14. The Bakelite Company issued Technical Bulletins #1, 2, & 3 describing Bakelite C-8 Epoxy resins BR-18774, BR-18795, & BR-18794.

6.1.15. The Shell Chemical Corporation issued

SC:54-63 – Epon Resin Odorless Architectural Paint Vehicles A-300 & A-301.

SC:55-9R – Epon Resins

SC:55-10 – Amine-Cured Epon Resin Coating Vehicles XA-200, XA-210, and XA-211.

SC:55-26 – Epon Resins for Structural Uses.

SC:55-27 – Recommendations for Handling Amine-Cured

Epon Resins and Their Formulations.

SC:55-32 – Epon Resin Vehicle Formulation XA-201 Incorporating Experimental Epon Curing Agent C-111.

cf:
1.2.16
2.1.6
2.2.2
8.1.6
27.1.2
27.3.14
27.4.1
36.1.1
38.4.1
Manufacturers:
Aries Laboratories
Bakelite Company
Ciba Company, Inc.
Furane Plastics Inc.
Jones-Dabney Company
The Marblette Corporation
Schenectady Varnish Company
Shell Chemical Corporation

6.2.1. Den Otter discusses epikote esters-new raw materials for industrial enamels. Three fatty acid esters of epikote resins are included:

1. the dehydrated castor oil fatty acid ester, with unequalled elasticity its outstanding property,
2. the coconut oil fatty acid ester, with lasting whiteness even at higher temperatures, and high chemical resistance its outstanding properties,
3. the linseed oil fatty acid ester, with excellent durability and water-resistance its outstanding properties.

PI, 4, #7, 10/54, p. 34

6.2.2. A progress report on room-temperature converting epoxy resins presents results obtained in the first series of test in which the pure epoxies were compared to fatty acid esters of the epoxy resins and to an alkyd resin. The purpose of this study was to determine the chemical resistance properties of room temperature converted epoxies, to compare the resistance properties of the pure room temperature converted epoxies to fatty acid esters of the epoxies, and to compare both of the above to alkyd resins.

The various tests to which the various systems were subjected are as follows:

1. salt spray over clean steel panels
2. salt spray over deliberately rusted panels
3. recheck of results in salt spray over clean steel panels
4. concentrated nitric acid
5. " sulphuric acid
6. " hydrochloric acid
7. glacial acetic acid
8. 1% Tide solution
9. Acetone
10. 10% Hydrochloric acid
11. 10% Acetic acid
12. 10% Caustic
13. saturated caustic

POCR, 118, #1, 1/15/55, p. 12

6.2.3. Wheeler presents part I on the properties and applications of epoxide resin esters. He discusses reactions of epoxide resins, the esterification reaction, a code for ready reference, method of manufacture, grade of epoxide resin and acid used, air drying esters, and baking application esters. PT, 19, #212, 5/55, p. 159.

6.2.4. Wheeler continues his discussion of the properties and applications of epoxide resin esters. This second part includes driers and solvents for epoxide resin esters, esterification with rosin and copal, plasticizers for acid-catalysed UF, use of these esters with chlorinated rubber, styrenated epoxide resin esters, oil varnishes, and varnishes for flat wall paints. PT, 19, #215, 8/55, p. 260.

6.2.5. The process of producing organic carboxylic acid esters of resinous epoxide alcohols which comprises heating to an alcoholysis temperature resinous epoxide alcohols which are polyether derivatives of dihydric phenols having alternating aliphatic groups and aromatic nuclei united through ether oxygen, including intermediate alcoholic hydroxyl-containing and terminal epoxide-containing aliphatic groups, with organic carboxylic acid esters of readily volatile monohydric alcohols under a high vacuum with volatilization and removal of the monohydric alcohol in the presence of a small amount of an alkaline alcoholysis catalyst, whereby selective esterification is effected of hydroxyl groups of the resinous epoxy alcohol to produce esters containing epoxide groups. USP 2,698,308.

6.2.6. A process of preparing a mixed ester which comprises heating and esterifying glycidyl polyether of a polyhydric phenol having a 1,2-epoxy equivalency greater than 1.0 and containing alternating glyceryl radicals and aromatic hydrocarbon radicals of the phenol united in a chain by ether oxygen atoms with glyceryl radicals at each end thereof, first with a drying oil fatty acid in amount of about 25% to 65% of the equivalent quantity needed to esterify completely the polyether, said heating being continued with removal of formed water until the ester product has an acid number of less than 10 and is devoid of epoxy groups, and then further esterifying the ester product as a solution in aromatic hydrocarbon solvent with about an added 1% to 3% of orthophosphoric acid based upon the weight of said ester product. USP 2,709,690.

6.2.7. The Shell Chemical Corporation issued Bulletin SC:54-46 describing Epon resin esters for surface coatings.

cf:
2.2.4
4.1.1
6.1.1
6.1.9
23.11.5
32.5.1
Manufacturers:
Jones-Dabney Company

6.3.1. The single stage process of producing high melting point epoxide resins having a melting point above 115° C. which comprises reacting with heating under pressure in a closed vessel, a chlorhydrin selected from the class which consists of epichlorhydrin and glycerol dichlorhydrin with a dihydric phenol free from reactive groups other than phenolic hydroxyl groups in the presence of sufficient aqueous caustic alkali to combine with the chlorine of the chlorhydrin, the proportions of chlorhydrin to the dehydric phenol being more than 1:1 and less than 1.2:1, the reaction being carried to a temperature above 110° C. while maintaining pressure in the closed vessel, separating the byproduct salt and any aqueous alkali from the resulting epoxide resin, adding preheated hot water to the resin under pressure in the closed vessel and agitating and washing the resin under pressure with hot water until the wash water is free from salt and caustic alkali, releasing the pressure, and

continuing the heating of the resin to free it from residual water. USP 2,694,694.

cf:
6.1.1.
6.1.9
6.4.1
27.13.1

6.4.1. Zonsveld discusses new developments in amine-cured epoxide finishes including (a) the use of amine adducts as curing agents, and (b) the precondensation of the epoxide resin with cross-linking agents, such as metaphenylene diamine and certain phenolic resins. After precondensation, sufficient epoxy groups are present in the vehicle to enable it to be cured with amines and amine adducts. Better flow of the paints, absence of blush in the films and improved water resistance of the coatings are among the advantages gained by the new techniques. JOCCA, 37, #414, 12/54, p. 670

cf:
6.1.1
6.1.9

CHAPTER 7

HALOGEN-CONTAINING RESINS

7.1.1. Codding, et al, studied fluorine-containingpolymers. This portion of the study of 1,1-dihydroperfluoroalkyl acrylates discusses the preparation of monomers. JPS, 15, #80, 2/55, p. 515.

7.1.2. Bovey, et al, studied fluorine-containing polymers. This portion discusses polymers and copolymers of 1,1-dihydroperfluoroalkyl acrylates. JPS, 15, #80, 2/55, p. 520.

7.1.3. Bovey & Abere, studying fluorine-containing polymers, discuss polymers of acrylates of fluorine-containing ether alcohols. JPS, 15, #80, 2/55, p. 537.

7.1.4. Rathmann & Bovey, studying fluorine-containing polymers, discuss light scattering and viscosity study of poly-1,1-dihydroperfluorobutyl acrylate. JPS, 15, #80, 2/55, p. 544.

7.1.5. Sandberg & Bovey, studying fluorine-containing polymers, discuss the copolymerization of 1,1-dihydroperfluorobutyl acrylate. JPS, 15, #80, 2/55, p. 553.

7.1.6. Stedry, et al, studying fluorine-containing polymers, discuss the compounding and properties of vulcanizates of 1,1-dihydroperfluoroalkyl acrylates. JPS, 15, #80, 2/55, p. 558.

7.2.1. Shankweiler reviews chlorinated natural rubber. Alone or in alkyd combinations, this resin has found application in formulating finishes having moisture-, acid-, alkali-, mold-, and mildew-resistant properties. PVP, 44, #11, 11/54, p. 48.

cf:
14.1.9
cf:
27.17.4
Manufacturers:
Hercules Powder Company

7.3.1. Edwards & Goldfinger investigated polyphenyl a substance prepared by the condensation of paradichlorobenzene using the Wurtz-Fittig reaction. The viscosity behavior of polyphenyl is unusual. The curves obtained by plotting specific viscosity divided by concentration versus concentration pass through a maximum at very low concentrations, reaching a constant value at a concentration of approximately 1%. JPS, 16, #82, 4/55, p. 589.

Manufacturers:
Monsanto Chemical Company

7.4. (No abstracts)

Manufacturers:
Diamond Alkali Company
Hercules Powder Company

CHAPTER 8

HYDROCARBON RESINS

8.1.1. Feldon, et al, present an evaluation of diene-type elastomers. An examination of a large number of elastomers (121) (summarized in Table XVII in the article) revealed that Alfin catalyzed polybutadine and emulsion copolymers of butadiene with relatively small proportions of acrylonitride and large proportions of methyl isopropenyl ketone exhibited minimum dimensional changes or prolonged contact with the test oil and solvents. The oil and solvent resistance of these polymers was comparable to that of Paracril 18-80. However, the flexibility at low temperatures of the acrylonitrile, and methyl isopropenyl ketone polymers was entirely unsatisfactory. Alfin-catalyzed polybutadiene possessed the requisite freeze resistance but, unfortunately, the compounding of alfin polybutadiene and mixing of this material in conventional equipment have presented processing problems. IEC, 46, #10, 10/54, p. 2248

8.1.2. Kaufman, et al, employed a pyrolytic dehydrogenation technique originally proposed by Szwarc, for the preparation of polyhydro-carbons from p-xylene, pseudocuemene, and durene. With particular emphasis on poly-p-xylylene, the structure and physical properties of the polymers were investigated. Poly-p-xylylene may be obtained either in an opaque or a transparent form. The opaque form melts at 412°C. Heat treatment of either form apparently results in an irreversible, polymorphic transition. Poly-p-xylylene can be stretched at temperature above 150°C to reveal a well-defined x-ray pattern; it is crosslinked to a small but definite extent.

The polymer derived from pseudocumene is also crosslinked but contains up to ca. 21% of a chloroform-extractable compounds. JPS, 13, #68, 2/54, p. 3

8.1.3. The preparation of poly-p-xylylene, , in 24-26% yield, by pyrolysis of p-xylene, is described in detail by Corley, et al. The nature and amount of by-products of the pyrolysis were determined. The following are described: x-ray diffraction, crystallinity, optical constants, infrared absorption spectrum, degradation by autoxidation in solvents and by pyrolysis, dielectric constant and loss, sulfonation and chlorination. The significance of this data is discussed relative to an understanding of the mode of formation and the structure of the polymer. JPS, 13, #68, 2/54, p. 137

8.1.4. An emulsion process is described by Crouch & Wicklatz, for the copolymerization of unsaturated organic compounds with sulfur dioxide to yield polysulfone resin latices from which the thermoplastic resins are recovered by coagulation.

The process is applicable to a variety of olefinic hydrocarbons including 1- and 2-butenes, higher aliphatic monoolefins, cycloolefins, and butadiene. Tertiary olefins do not react under usual conditions, and in admixture with polymerizable olefins they retard the reaction.

Polysulfones of improved thermal stability are obtained by the use of small quantities of certain non-hydrocarbon monomers such as acrylonitrile and ethyl acrylate in the polymerization charge or by the addition of stabilizers to the resins. A number of plasticizers have been found to be compatible with the resins. The polysulfones are also compatible with butadiene-acrylonitrile rubbers to give compounds of greatly improved impact resistance. IEC, 47, #1, 1/55, p. 160

8.1.5. Marvel, et al, have prepared copolymers of butadiene with α-methylene-δ-methyladiponitrile, 2-methyl-2-nitropropyl acrylate, 1-cyanoethyl acrylate, 2-cyanoethyl acrylate, cyanomethyl acrylate, and 2-cyano-2-propyl acrylate, and terpolymers of butadiene with acrylic acid and acrylonitrile and of butadiene with acrylonitrile and α-methylene-δ-methyladiponitrile and evaluated them as rubbers. The syntheses of the new monomers are also presented.

No outstanding low temperature, oil-resistant rubber has been found, but certain factors that relate the properties of a polymer in this series to its composition have been clarified. IEC, 47, #2, 2/55, p. 344

8.1.6. Jorczak & Dworkin describe five grades of polysulfide liquid polymers, finding use for sealants, flexible molds and patterns, modifying epoxies, and leather impregnants. MM, 41, #5, 5/55, p. 110

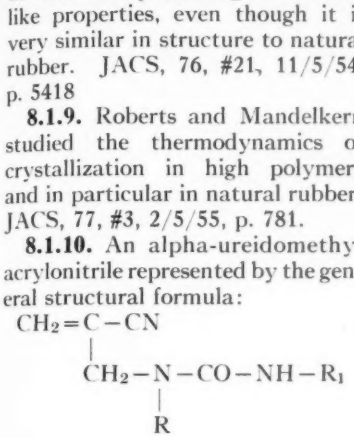
8.1.7. Snodden & Middleton describe polysulfide liquid polymer sealers which are flexible and can be applied by an air-driven caulking gun to provide an excellent pressure seal. The flexibility of polysulfide sealers permits their use under conditions of expansion, contraction and torsion. PE, 26, #3, 3/55, p. 129

8.1.8. Bailey & Golden polymerized the cyclic diene, 1, 2-dimethylenecyclohexane, to a high

molecular weight, all -1, 4-, all-cis diene polymer. This polymer was a white crystalline solid, melting at 165° and possessing no rubber-like properties, even though it is very similar in structure to natural rubber. JACS, 76, #21, 11/5/54, p. 5418

8.1.9. Roberts and Mandelkern studied the thermodynamics of crystallization in high polymers and in particular in natural rubber. JACS, 77, #3, 2/5/55, p. 781.

8.1.10. An alpha-ureidomethyl acrylonitrile represented by the general structural formula:



wherein R represents a member selected from the group consisting of a hydrogen atom and the group —CO—NH—R_1, and R_1 represents a member selected from the group consisting of an atom of hydrogen, an alkyl group containing from 1 to 4 carbon atoms, a phenyl group and a tolyl group. USP 2,704,751.

8.1.11. A process for making a resin from a normally liquid mixture of unsaturated hydrocarbons obtained in the pyrolysis of a normally gaseous hydrocarbon having at least two carbon atoms in the molecule at a temperature between about 1300 and 1550° F. and a contact time between about 0.2 and 5 seconds, which comprises contacting said normally liquid mixture of unsaturated hydrocarbons with above about 0.5 percent by weight of boron trifluoride in the substantial absence of water and organic oxygenated compounds at a temperature above about 500° F., whereby a portion of said unsaturated hydrocarbons is converted into a thermoplastic resin, removing said boron trifluoride from the reaction product at a temperature above about 500° F., and removing low-boiling components from the reaction product, whereby a thermoplastic resin is obtained having an iodine number below about 80, light color, and superior susceptibility to decolorization. USP 2,709,695.

8.1.12. The Phillips Petroleum Company issued 21-page Bulletin MD-4 describing Butarez - liquid polybutadiene.

cf:
11.1.2
14.1.2
25.7.3
25.7.4
27.15.1
27.17.4
Manufacturers:
Advance Solvents & Chemical Corp.
American Mineral Spirits Company
The R. J. Brown Company
Enjay Company, Inc.
The Goodyear Tire & Rubber Co., Inc.
Indoil Chemical Co.npany
Kenrich Corporation
Neville Chemical Company
Nova Chemical Corp.
Oronite Chemical Company
Pan American Chemicals
Pennsylvania Industrial Chemical Corp.
Petroleum Specialties Company
Solar Compounds Corporation
Sun Oil Company
Thiokol Corporation
Velsicol Chemical Corp.

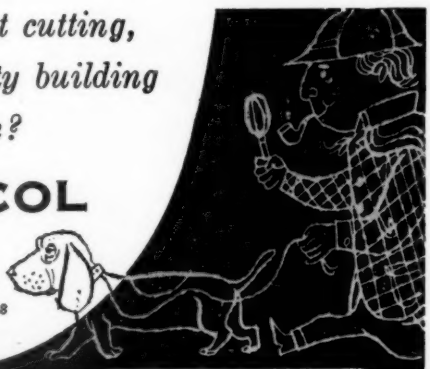
8.2.1. Craig reviews hydrocarbon and coumarone-indene resins. Alone or in conjunction with other vehicles; these low cost resins have a variety of applications: aluminum vehicles, bronzing liquids, ship-bottom paints, can lining, etc. Properties of resins, properties of coatings, formulating techniques, end use of coatings, and future prospects are discussed. PVP, 44, #11, 11/54, p. 60

cf:
2.1.1
Manufacturers:
Barrett Div., Allied Chemical & Dye Corp.
Neville Chemical Company
Pennsylvania Industrial Chemical Corp.

Looking for a cost cutting, quality building miracle additive?

USE **VELSICOL**

hydrocarbon resins to make better paints and coating vehicles at lower cost!



Here are the facts!

SPECIFICATION PROPERTIES	AD-21	AB-11-4	AB-11-4 Special	EG-11-H	X-30
Type	Heat reactive	Thermoplastic	Thermoplastic	Thermoplastic	Thermoplastic
Form	Solid	Solid or flaked	Solid	Solid	Solution
Specific Gravity	1.07-1.09	1.06-1.09	1.07-1.10	1.05-1.08	———
Weight per gallon (lbs.)	8.91-9.08	8.83-9.08	8.91-9.16	8.75-8.99	———
Melting Point (Ball & Ring)	200-220°F	220-230°F	240-250°F	170-180°F	210-220°F
Color (Coal Tar Scale)	*	3-5	3½-4½	3-5	1½-2**
Iodine Number	220 min.	130 max.	130 max.	130 max.	120 max.
Saponification Number	0-2	0-2	0-2	0-2	0-2
Acid Number	0-2	0-2	0-2	0-2	0-2

*Colors: Gardner: 13-15; Barrett: 3-3½; Rosin Scale: F.
**Colors: Gardner: 10-11; Rosin Scale: I-K.

Type AD-21 and AB-11 also available in solution, for cold cutting.

Completely soluble in common aliphatic and aromatic napthas. Compatible with drying and non-drying oils, waxes, resins, plastics, elastomers, etc.

ALUMINUM VEHICLES: better leafing and leaf retention, higher lustre, faster drying.
VARNISHES, ENAMELS: fast air dry; more flexibility, hardness, adhesion; high gloss.
TRAFFIC PAINTS: excellent film forming properties; compatible with chlorinated rubber and synthetic copolymers.

Velsicol Resins make all of these products resistant to water, alkalis, aqueous acids, and salt, and they also improve bronzing liquids, long oil alkyds, membrane curing compounds and waterproofing agents.

Write for Technical Bulletins 219 and 203.

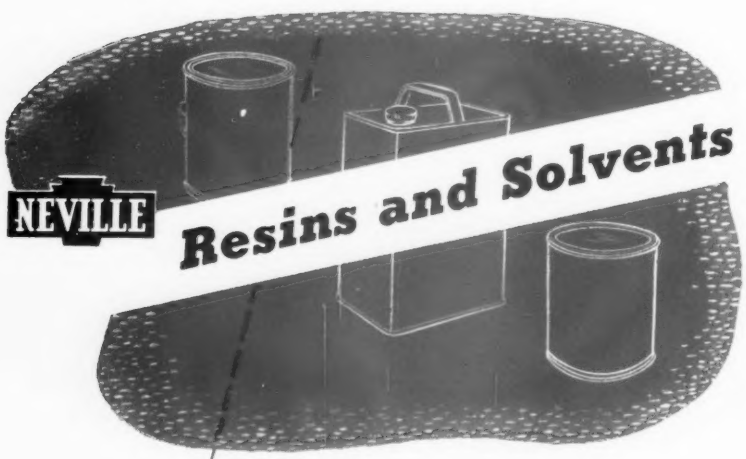
VELSICOL
CHEMICAL CORPORATION
Dept. 104 330 East Grand Ave., Chicago 11, Illinois

VELSICOL

8.3.1. A high softening point resin consisting essentially of a 240°-280° C. heat-reaction product of about 100 parts by weight of a non-aromatic unsaturated hydrocarbon resin which is an oleondiolefin polymerization product obtained by treating a steam cracked petroleum distillate boiling in the range of about 20 to 280° C. in the presence of 0.25 to 2.5% Friedel-Crafts catalyst at a temperature of . . 100° C. to *M*100° C. reacted with about 50 to 100 parts by weight of dicyclopentadiene, asid resin reaction product having a substantially higher heat softening point than that of said olefin-diolefin resin prior to reaction with the dicyclopentadiene. USP 2,698,841.

8.3.2. A process for raising the softening point of a petroleum cracked distillate resins which comprises mixing 100 parts of the resin with at least 5 parts of an oily diolefin hydrocarbon polymer and heating the mixture at a temperature of between 240° and 280° C. USP 2,705,703.

Manufacturers:
Pan American Oil Company
Pennsylvania Industrial Chemical Corp.
Petroleum Specialties Company
Phillips Petroleum Company
Sun Oil Company



for making **better** paints and varnishes

Coumarone & Petroleum Resins
Heat Reactive Resins
Resin Solutions
Aromatic Solvents
Anti-Skinning Agents
Shingle Stain Oils

Neville has kept pace with the industry's progress by continually developing and improving processes and products. The result . . . you can always depend upon Neville Resins and Solvents in making modern, quality paints and varnishes to meet today's ever increasing commercial and industrial demands!

NEVILLE CHEMICAL CO.
PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

8.4. (No abstracts)

Manufacturers:
Hercules Powder Company
Pennsylvania Industrial Chemical Corp.

8.5.1. Polson describes the use of styrene/butadiene copolymers in paints. The nature of styrene/butadiene paint resins, the use of the styrene/butadiene copolymers, the formulation of styrene/butadiene copolymer paints, and the manufacture of paint from styrene/butadiene copolymers are described. CPVM, 28, #8, 8/54, p. 20

8.5.2. Polson presents Part II of his article describing the use of styrene butadiene copolymers in paints. The description of the production of these paints is continued. The problem of color differential in exterior masonry paints is included. The market for styrene/butadiene copolymer paints is reviewed. CPVM, 28, #9, 9/54, p. 42

cf:
2.1.1
32.2.25
38.8.2
Manufacturers:
Dewey & Almy Chemical Company
The Goodyear Tire & Rubber Company
Marbon Chemical Division
Naugatuck Chemical Co.
West Virginia Pulp & Paper Company

8.6.1. Corbett found variation in penetration test results on bituminous materials to be primarily attributable to measurement errors with smaller variation effects due to sampling technique, the asphalt itself, or to both. ASTM, #206, 5/55, p. 63

8.6.2. Sugihara and Sorenson studied the pyrolysis of Gilsonite which yielded a distillate, from which pyrrols and phenols were separated in the form of potassium salts. Pyridines then were extracted with aqueous phosphoric acid. The identification of pyrrole, 2-methylpyrrole, phenol, o-cresol, 3,5-dimethylphenol, 1-naphthol, 4-picoline, 2,6-lutidine, 3,4-lutidine, 2,5-lutidine, 3,5-lutidine, and 2,3,5-trimethylpyridine is described. JACS, 77, #4, 2/20/55, p. 963.

8.6.3. A substantially dry asphaltic mix in a finely divided dry powder form characterized by substantially spontaneous dispersibility in water after the particles have be-

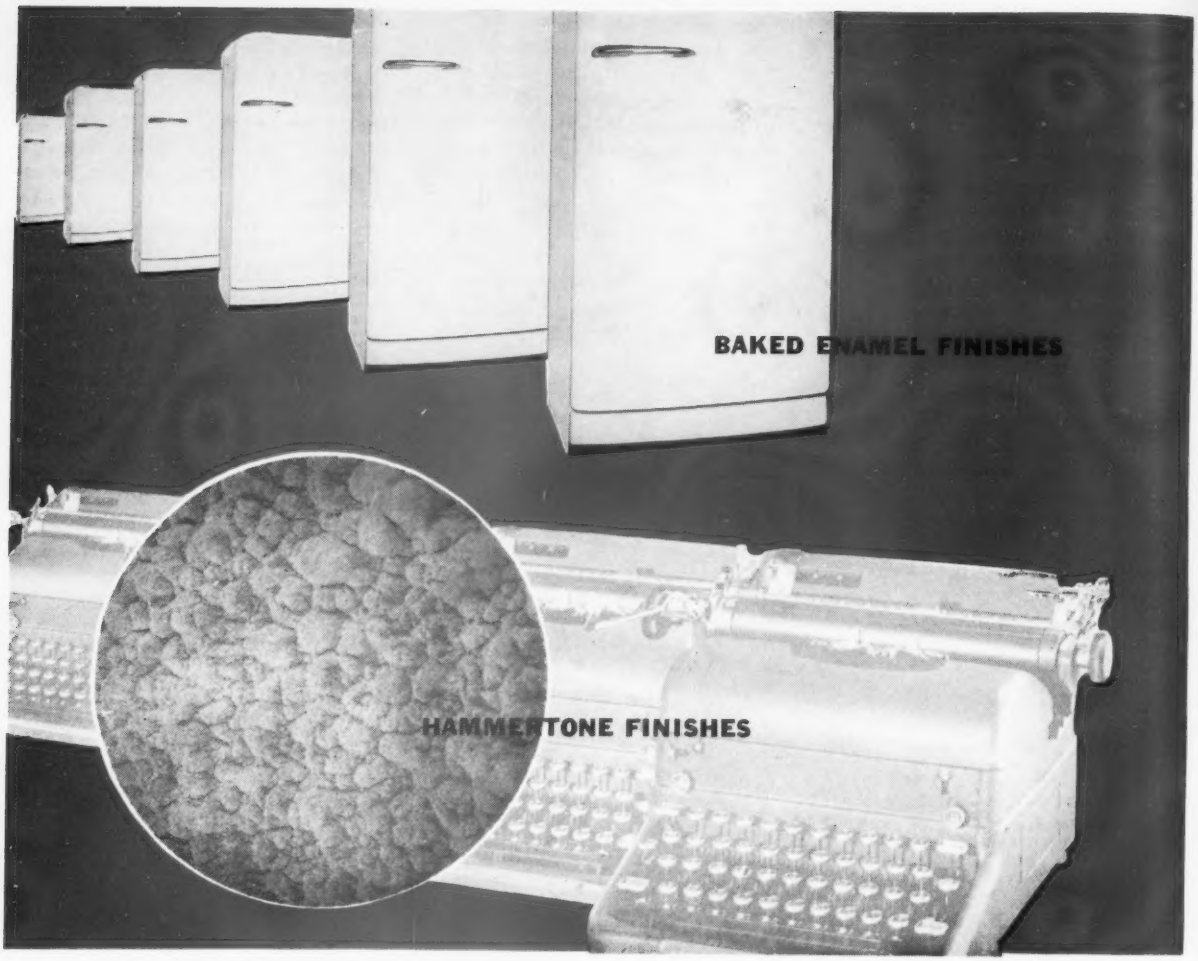
come wet, said mix comprising the following components in the following proportions:

	Parts by weight
Finely divided friable asphaltic material	100
A finely divided dry dispersing agent selected from the group consisting of organic sulfonic acids, salts of organic sulfonic acids, lignosulfonate salts, water soluble soaps, polyoxyethylene stearate, sorbitan tristearate, sulfated fatty alcohols and sulfonated alkylphenoxyethanols	3 to 25
and a finely divided dry protective colloid	2 to 10

said mix having a degree of fineness ..such that a majority of the particles pass through a 300 mesh screen. USP 2,714,582.

8.6.4. G. S. Ziegler & Company issued 60-page book describing Natural Asphalts and Stearine Pitch.

cf:
27.17.4
Manufacturers:
Allied Asphalt & Mineral Corp.
Anderson-Prichard Oil Company
Barber Asphalt Corporation
Barrett Division
Newport Industries, Inc.
Pennsylvania Industrial Chemical Corp.
G. S. Ziegler & Company



If you want Uniformity... use PLASKON® coating resins!

Paint manufacturers know they can depend on the "batch-to-batch" uniformity of PLASKON Coating Resins to save them time and money through trouble-free operations. Yes, uniformity is one of the keys to the popularity of PLASKON Coating Resins . . . it's the extra stress laid on quality control, from Barrett prime raw materials to finished product, that makes the difference.

Two New Plaskon Resins

PLASKON 3309, a new stable urea resin developed especially for refrigerator and other appliance baking enamels, features high resistance to grease. When used as the amine resin component, it imparts high resistance to water, humidity and stains. Baking schedules as short as twenty minutes at 280°F, high gloss and color retention make this resin even more attractive.

PLASKON COATING RESIN 3801 provides brilliant and uniform hammer-tone finishes for typewriters and similar products. This new styrene-alkyd resin also can be easily pigmented in white or full colors with unusually fast drying or curing rates. PLASKON 3801 assures excellent color, gloss retention, long shelf life.

Why not let the outstanding quality and uniformity of PLASKON Coating Resins go to work for you? You'll be amazed at the time, money and headaches these specialized products can save you. For further information, write or call BARRETT DIVISION, DEPT. 58B, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. Telephone: HAnover 2-7300.

Barrett PLASKON

CHAPTER 9

NITROGEN-CONTAINING RESINS

9.1.1. Parker reviews amino resins. General application of these resins is in the formulation of baking-type finishes of varying properties for metal products. An amino resin, in its final form, is more of a solvated polymeric "ether" body. Included are chemical considerations, curing mechanisms, type differences, applications, theoretical possibilities, practical aspects, and future prospects. PVP, 44, #11, 11/54, p. 42

9.1.2. Rao reviews plastics from proteins and lignin. Several attempts have been made to make plastic compositions from these materials with only limited success. A brief review of the various processes suggested for their utilization as plastic compositions is given. PI, 4, #10, 1/55, p. 29

9.1.3. Rao continues his review on plastics from proteins and lignin. 90 references are included. PI, 4, #11, 2/55, p. 33

9.1.4. Von Hippel and Waugh studied casein monomers and polymers. JACS, 77, #16, 8/20/55, p. 4311

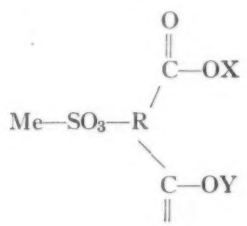
9.1.5. α - Methylstyrene and β - pinene have been found (Hennion, etal), to condense with formaldehyde and secondary amines in acetic acid-sulfuric acid. Anethole under similar conditions also reacted, but by a different reaction. Styrene, cyclohexene, and 1,1-diphenylethylene failed to react. JACS, 77, #17, 9/5/55, p. 4633

9.1.6. A composition of matter comprising polymeric acrylonitrile containing in the polymer molecule at least 80% by weight of acrylonitrile, and a substituted urea of the formula

$(CH_3)_2NCONRR'$,

wherein R and R' are alkyl groups of less than four carbon atoms. USP 2,683,128

9.1.7. An essentially anhydrous liquid coating composition soluble in oleoresinous varnishes and insoluble in water which comprises the condensation product of an aldehyde selected from the group consisting of formaldehyde, acetaldehyde, butyraldehyde, furfuraldehyde and benzaldehyde and an amine selected from the class consisting of carbamide, polyamino diazines and polyamino triazines characterized by the presence therein of at least two amino groups possessing replaceable hydrogen atoms terminally condensed under aqueous acidic conditions, the mol ratio of the aldehyde to said amino groups being within the range of from 1:2 to 2:1, containing as the essential ingredient therein a catalytic amount but not more than 5% by weight of the condensation product of an ester of a dicarboxylic acid having the formula



wherein Me is selected from the group consisting of ammonia and salt forming metal ions, R is a saturated aliphatic hydrocarbon group substituted by the sulfonate group on one of the carbon atoms in the positions alphabeta with respect to the —COOX and —COOY groups but free from other substituents and X and Y are selected from the group consisting of non-substituted and hydroxyl substituted alkeny, alkyl, aryl and alkaryl groups containing from 1 to 12 carbon atoms. USP 2,704,750

9.1.8. An air-drying ether of a formaldehyde condensation product of an aminotriazine containing at least two NH_2-groups in which ether at least one hydroxymethyl group per NH_2-group present in the aminotriazine is etherified with a monohydric unsubstituted unsaturated aliphatic alcohol having at least 18 carbon atoms and containing at least two double bonds. USP 2,709,693

9.1.9. Hansborg & Company issued 8-page booklet describing PEI—polymerized ethylene imine.

Manufacturers:
Hansborg & Company

9.2.1. A process using paraformaldehyde and permitting manufacture in alkyd-making plants is described by Seaborne. A time schedule and materials balance conveniently summarize the process and the mechanism of reaction is discussed. JOCCA, 38, #7, 7/55, p. 345

9.2.2. A process for preparing a water soluble melamineformaldehyde resin comprising reacting at elevated temperatures melamine, formaldehyde and a compound having the general formula: $NH_2\ (CH_2)_n OSO_3X$, wherein n is a whole number between 1 and 6, inclusive, and X is a member selected from the group consisting of H, Li, K, Na, NH_4 and hydrogen in combination with a water soluble tertiary amine and, wherein the mol ratios of the reactants are 1:2:0.03 to 1:5:0.5, respectively. USP 2,688,607

9.2.3. A process for producing a resinous composition, suitable for use in preparing laminate surfaces, comprising heating melamine, formaldehyde and a polyvinyl butyral at a pH between about 7-10.5 and at a temperature between about 75° C. and reflux in an alcohol aqueous medium until the reaction solution no longer crystallizes upon cooling to 0° C., wherein the mol ratio of the melamine to formaldehyde is between 1:1.5 and 1:4.5, respectively, wherein said polyvinyl butyral has a hydroxyl number between about 400 and 800 and said polyvinyl butyral is present in the composition in an amount varying between about 20%—40% by weight based on the total weight of resin solids wherein said alcohol is a lower saturated monohydric aliphatic alcohol having 1—4 carbon atoms and said aqueous alcohol solution has a concentration of alcohol between about 40—80% by weight based on the total weight of alcohol aqueous solution. USP 2,697,086

9.2.4. Reichhold Chemicals, Inc., issued Technical Bulletin SC-10 describing #3550-50 Super-Beckamine—an aromatic solvent-soluble melamine-formaldehyde resin.

cf:
27.17.4
Manufacturers:
American Cyanamid Company
Monsanto Chemical Company
P.askon, Barrett Div.,
Allied Chemical & Dye Corp.
Reichhold Chemicals Inc.
Rohm & Haas Company

9.3.1. A process for preparing polyhydroxy-polyalkylene-polyureaformaldehyde condensates which comprises reacting between about 0° and 100° C. in the presence of water epichlorohydrin and an alkylene polyamine having two to three carbon atoms in the alkylene portion thereof in a mole ratio from 1:1 to 1.4:1 until an aqueous solution of the resulting polyhydroxypolyalkylenepolyamine at a concentration of about 46% has a viscosity from J to Z_7 at 25° C. on the Gardner-Holdt scale, reacting said polyhydroxypolyalkylenepolyamine with urea between 100° and 200° C. in a ratio from 0.5:1 to 1.8:1 of urea per—NH—group of said polyhydroxypolyalkylenepolyamine until an aqueous 45% solution of the resulting polyhydroxypolyalkylenepolyurea has a viscosity from B to Z_3 at 25° C. on the Gardner-Holdt scale, and reacting said polyhydroxypolyalkylenepolyurea with formaldehyde in a solution at a pH between 7 and 9.5. USP 2,699,435

9.3.2. The Rohm & Haas Company issued 13-page bulletin describing Uformite 400, a high solids, aqueous ureaformaldehyde resin adhesive.

cf:
27.17.4
38.4 1
Manufacturers:
American Cyanamid Company
Bakelite Company
The Borden Company, Chemical Div.
Jones-Dabney Company
Monsanto Chemical Company
Reichhold Chemicals, Inc.
Rohm & Haas Company
Synvar Corporation

9.4.1. Johnson discusses the use of isocyanates in coatings. Developed in Western Germany, isocyanate resins are said to impart unusual properties to coatings. CPVM, 28, #11, 11/54, p. 5

9.4.2. Katz describes isocyanate-base polymers. Rigid and flexible foams are biggest present applications. Others in use or on the way are elastomers, coatings, potting compounds, adhesives, greases and heat resistant plastics. MM, 42, #2, 8/55, p. 84

9.4.3. Wide-spread applications are predicted for polyurethanes that can be foamed, molded, and used in surface coatings, adhesives, and synthetic rubber. MP, 32, #12, 8/55, p. 102

cf:
2.1.6
4.1.5
Manufacturers:
E. I. duPont de Nemours and Co., Inc.
National Aniline, Div. of Allied Chemical & Dye Corp.
Mobay Chemicals Co.

CHAPTER 10

NATURAL RESINS

10.1.1. Further studies have been made by Pearl and Beyer of chromatographic fractionation of lignin oxidation mixtures, with separation of a variety of products. JACS, 76, #23, 12/5/54, p. 6106

10.1.2. Mills & Werner discuss the application of the technique of partition chromatography on paper to the analysis of dammar. PM, 25, #18, 8/55, p. 307

27.17.3
Manufacturers:
Archer-Daniels-Midland Company
Delou, Inc.
France, Campbell & Darling, Inc.
Gillespie-Rogers-Pyatt Co., Inc.
O. G. Innes Corporation
The Mead Corporation
Morningstar, Nicol, Inc.
William Zinsser & Company

10.2.1. Kamath, et al, examined the various methods recommended for fractionation of lac (shellac). A new method which consists in treatment of an alcoholic solution of lac with a mixture of either hexane and butyl alcohol, or white spirit and butyl alcohol or only "solvent oil" is described. The use of hard lac resin in surface coatings was studied and the possibility of employing the butyl ester of soft lac as a plasticizer investigated. PI, 4, #6, 9/54, p. 27

10.2.2. Kamath & Nagarsenkar describe the preparation of molding powders based on shellac. Compared with phenol-formaldehyde, shellac powders show superior electrical properties, but slightly inferior mechanical properties. PI, 5, #4, 7/55, p. 22

Manufacturers:
Acme Shellac Products Company
Delou, Inc.
Gillespie-Rogers-Pyatt Co., Inc.
William Zinsser & Company

If You Make

LACQUERS

you are interested in improved gloss—flexibility — adhesion — depth of film—leveling — ultra-violet light resistance.

GRP WHITE FRENCH SHELLAC

(dewaxed)

The unique resin in solution imparting these most essential properties. Available in several types for individual requirements.

Send for informative leaflet.

GRP

The *Preferred* Shellac

GILLESPIE-ROGERS-PYATT CO., INC.

75 West St., New York 6, N. Y. Plant—Jersey City, N. J.

CHAPTER 11

PHENOLICS

11.1.1. Manko reviews hard synthetics. This class includes maleics, modified phenolics, pure phenolics, and copal type synthetics-all of which can provide a range of properties to meet many requirements. Maleics, modified phenolics, pure phenolics, and copal type synthetics are discussed. PVP, 44, #11, 11/54, p. 58.

11.1.2. Bentley & Rappaport developed a method for semiquantitative analysis of Buna N phenolic resin blends that cannot be handled by conventional methods, because of their physical intractability. It is based on the pyrolysis technique combined with standard infrared quantitative procedures. AC, 26, #12, 12/54, p. 1980.

11.1.3. Wells discusses industrial maintenance coatings based on phenolic resins. Acid catalyzed reactions and alkaline catalyzed resins are described. Phenolic resins have a very definite and important role in the field of protective coatings and their increased use from year to year indicates that this trend will continue. It is believed that there is no other type of resinous material which combines all the desirable properties of these materials for the protection of the billions of dollars of industrial equipment and structures from the ravages of time and the elements. APJ, 39, #39, 6/13/55, p. 70

11.1.4. Mukherjea presents a study of the chemistry and uses of phenolic resins. PI, 5, #1, 4/55, p. 95

11.1.5. The Bakelite Company issued 8-page Temporary Technical Bulletin #227 describing the BR-9400 "Cold-Mix" Varnish Technique for preparing varnishes without cooking. Also, Release #3a listing new "cold-mix" formulations.

cf:
1.2.6
2.1.1
2.1.6
27.3.8
27.17.4
32.2.1
38.4.1
38.7.3

Manufacturers:
Adco Chemical Company
Alkydol Labs., Inc.
American Cyanamid Company
Archer-Daniels-Midland Company
Bakelite Company
Borden Company, Chemical Division
Crownoil Chemical Company
Durez Plastics & Chemicals ,Inc.
France, Campbell & Darling, Inc.
General Electric Company
Hercules Powder Company
Krumbhaar Chemicals, Inc.
McCloskey Varnish Company
Monsanto Chemical Company
Neville Chemical Company
Plaskon, Barrett Div., Allied Chemical & Dye Company
Reichhold Chemicals, Inc.
Rohm & Haas Company
Schnectady Varnish Company
Snyder Chemical Corporation
Synvar Corporation
The Thibaut & Walker Co., Inc.
T. F. Washburn Company

11.2.1. Boelhouwer, et al, investigated the structure of certain novolacs prepared by polycondensation of formaldehyde with phenol, p-cresol, and m-cresol respectively. From ultimate analysis and physical constants of the hydrocarbons, conclusions were made as to the structure of the novolacs. They are linear thermoplasts; no "extra" rings are present. JPS, 17, #85, 7/55, p. 411

11.2.2. A resinous composition having the empirical formula in which:

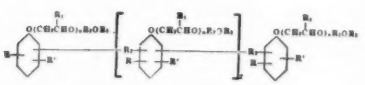
R and R' are monovalent radicals selected from the group consisting of the hydrogen, cyclohexyl, alkyl, alkenyl, aryl and alkaryl radicals;

R_1 is a monovalent radical selected from the group consisting of the hydrogen, methyl, ethyl, phenyl, —CH_2O alkyl, —CH_2O alkenyl and —CH_2O aryl radicals;

R_2 is a divalent radical selected from the group consisting of the CH_2CH_3CH, CH_3CH_2CH and CH_3-CH_2CH_2CH radicals and represents the residue of an aliphatic C_1—C_4 aldehyde;

R_3 is a monovalent alkyl radical and represents the residue of an aliphatic monohydric alcohol;

n is a number equal to at least 1 and x is an integer equal to at least 1.



U. S. Patent 2,705,704

cf:
2.2.4
11.1.1

11.3.1. In making a resinous composition, the method which comprises maintaining phenol in contact with formaldehyde, in the proportion of approximately 0.8 to 2.5 mols for 1 mol of the phenol, alkali and water, until condensation occurs to give a water soluble condensation product and until the content of free formaldehyde ceases to fall rapidly; then introducing into the resulting water soluble condensation product a lactone selected from the group consisting of beta-propiolactone, beta-butyrolactone, and beta-iso-butyrolactone, in the proportion of 0.1 to 1 mol of the lactone for 1 mol of the phenol used, and a water soluble alkali in amount if any required to establish the pH of the resulting mixture at a level at least as high as 4; introducing the said alkali in additional amount if any required from time to time to maintain the pH at the said level; and continuing the contact of the said condensation product, lactone and alkali until reaction in the mixture practically ceases. USP 2,692,865

cf:
2.2.4
11.1.1

11.4. (No abstracts)

cf:
11.1.1

CHAPTER 12

POLYAMIDES

12.1.1. Goodman describes briefly certain results which extend considerably and correlate the findings of previous workers regarding the thermal degradation of 66 nylon (polyhexamethylene adipamide). JPS, 13, #68, 2/54, p. 175

12.1.2. Peerman, et al, demonstrated by infrared absorption techniques that the end groups for certain polyamide resins may be cyclic. The resins studied were based on dimerized, unsaturated vegetable oil acids and short chain di- and polyamines. Whereas resins based on ethylenediamine do not have cyclic end groups, resins prepared with diethylenetriamine have imidazoline end groups. Correspondingly, resins made with 1,3-diaminopropane appear to have only amine end groups, whereas those based on imino-bis-propylamine show evidence of tetrahydropyrimidine end groups. JACS 76, #23, 12/5/54, p. 6085

12.1.3. Kohlwey & Maters describe polyamides based on E-caprolactam. MP, 33, #1, 9/55, p. 158

12.1.4. Cleaver and Pratt describe the synthesis and properties of a little studied class of polyamides. The polymers are formed at room temperature by polymerization of 2,2' -bis- [5(4H)-oxazolones] with diamines. An unusual repeating unit results which contains regularly-spaced α -amino acid residues between the dicarboxylic acid and the diamine components and a regular arrangement of both "head-to-tail" and "tail-to-tail" amide groups. JACS, 77, #6, 3/20/55, p. 1541

12.1.5. Haas, et al, discuss hydroxyethyl nylons, new flexible superpolyamide derivatives. These are a new interesting class of stable nylon derivate which may be useful for a variety of purposes, particularly where nylon character coupled with greater flexibility, rubberiness, and higher water sorption are desired. JPS, 15, #80, 2/55, p. 427

12.1.6. Holmes, et al, determined the crystal structure of nylon 6 by interpretation of the x-ray diffraction patterns given by drawn, rolled fibers. The determination was part of a program to investigate the relation between structure and physical properties, in particular melting point. Nylon 6 melts 50° C. lower that its isomer nylon 66. JPS, 17, #84, 6/55, p. 159

cf:
2.2.3
37.11.2

Manufacturers:
E. I. Dupont de Nemours & Co., Inc.
General Mills, Inc.
Nopco Chemical Company
G. S. Ziegler & Company

12.2.1. Shock and impact resistance, flexibility, good adhesion, high gloss, resistance to alkali, chemicals, water, oil, and grease may be obtained with various combinations of polyamide-epoxy blends. This article discusses advantages, specific properties, compatibilities, preparation of blends, curing time, & suggested uses. PVP, 44, #11, 11/54, p. 54

12.2.2. Floyd, et al, describe the advances made on blending polyamide resins with epoxy resins. Outstanding characteristics of these new coating materials are excellent impact resistance and a high degree of flexibility, coupled with a high degree of hardness, excellent gloss, and excellent chemical resistance. CPVM, 28, #12, 12/54, p. 10

12.2.3. A stabilized organic-solvent solution of an epoxy resinous material containing terminal epoxy groups and being derived by the reaction of a bisphenol with a material selected from the group consisting of glycerol dichlorhydrin and epichlorhydrin, and a polyamide derived from polymeric fat acids and diethylene triamine, the solution being stabilized by means of from 1-30% of formaldehyde based on weight of the polyamide. USP 2,707,708

cf:
27.1.2

POLYETHYLENES

13.1.1. Dick reviews progress in polythene. The main process and India's special problems are discussed. PI, 5, #4, 7/55, p. 19

13.1.2. Keller interprets unusual orientation phenomena in polyethylene in terms of the morphology. JPS, 15, #79, 1/55, p. 31

13.1.3. Keller & Sandeman investigated the unusual orientation in polyethylene by infrared spectroscopy. JPS, 15, #79, 1/55, p. 133

13.1.4. A convenient and rapid x-ray diffraction method is described, by Aggarwal and Tilley for determining percent crystallinity in polyethylene using a scanning goniometer with Geiger tube and scaler counter. The samples of polyethylene studied were found to have 65 - 71% crystallinity. Also, the temperature at which polyethylene melt is quenched has no appreciable effect on the crystalline content. JPS, 18, #87, 9/55, p. 17

13.1.5. The Koppers Company, Inc., issued 16-page Bulleting #C-5-216 describing Super Dylan - polyethelene.

13.1.6. The U. S. Industrial Chemicals Company issued 12-page booklet describing Petrothene - polyethylene resins.

cf:
13.2.1
14.1.4
18.7.1
27.11.2
27.17.4

Manufacturers:
Bakelite Company
E. I. Dupont de Nemours & Co., Inc.
Eastman Chemical Products
The M. W. Kellogg Company
Semet-Solvay Petrochemical Division
U. S. Industrial Chemicals Company

13.2.1. Dole, et al, describe the irradiation of polyethylene, in the form of films and granules, in the heavy water pile of the Argonne National Laboratory, both in a vacuum and in the presence of air. The composition of the evolved gas, stress-strain relations and tensile strength were determined for one period of irradiation. Bromine adsorption, infrared adsorption sprectra, extent of gel formation and viscosity of solutions were measured as a function of the duration of irradiation. The first noticeable change was the disappearance of the vinylidene group as hydrogen was evolved. This decrease in unsaturation was more than compensated for by the formation of the vinylene group. 70% to 80% of the H_2 evolved produced unsaturation, the remaining 20 to 30% cross linkages. The cross-linking produced marked changes in the stress-strain characteristics without greatly affecting the tensile strength when the irradiation was carried out in a vacuum. A postulate of long range migration of chemically active centers is proposed to explain the initial rapid decrease in the vinylidene concentration. JACS, 76, #17, 9/5/54, p. 4304

13.3.1. Smook & Smith discuss the use of "Hypalon" - chlorosulfonated polyethylene. Compounding, solvent solutions, solvent dispersions, can stability, modifications of the formulation, colors, coatings for rubber, clear lacquers, fabric coatings, and chemical-resistant coatings for metal are discussed.

Suitably compounded and cured coatings of "Hypalon" have these advantages:

1. complete resistance to ozone
2. outstanding resistance to sunlight and weather
3. excellent resistance to chemicals, especially oxidizing agents
4. will not support combustion
5. unusually good resistance to scuffing and abrasion
6. excellent color stability and good physical properties in a wide range of colors
7. low-temperature flexibility
8. excellent heat resistance at temperatures in the range of 250° to 300° F.
9. good adhesion to rubber, fabrics, metal, wood, and masonry
10. a high degree of flexibility and excellent flex-life.

PVP, 45, #2, 2/55, p. 25

13.3.2. Duus obtained heats of formation for five representative fluorcarbons. The following were obtained (kcal): CF_4, 212.7; C_2F_4, 151.3; C_3F_6, 257.8; cyclo-C_4F_8, 352.0; C_2F_4 polymer, 199.9; COF_2, 166.6.

These results provide data for calculating heat balances in commercial processes for manufacture of tetra-fluoroethylene monomer or polymer and are important in guiding investigations toward new and improved processes. IEC, 47, #7, 7/55, p. 1445

13.3.3. Marx & Dole measured the specific heat of polytetrafluoroethylene from −25 to 120° on powdered and drawn samples. A modified order-disorder theory is presented which agrees somewhat better with the data but which has serious theoretical difficulties. JACS, 77, #18, 9/20/55, p. 4771

13.3.4. The Bakelite Company issued 16-page booklet describing Fluorothene Resins—properties, forms, and fabrication.

13.3.5. E. I. duPont de Nemours & Co., Inc., issued 60-page booklet describing Teflon—tetrafluoroethylene resin.

cf:
1.2.17
14.1.4
21.1.2
38.5.1

Manufacturers:
Bakelite Company
E. I. Dupont de Nemours & Co., Inc.
The M. W. Kellogg Company

CHAPTER 14

POLYSTYRENE

14.1.1. Roth discusses sulfonation products from polymers of styrene and vinyltoluene. The sulfonation of polystyrenes and polyvinyl toluenes of various molecular weights appears to have been accomplished with little or no attend- and cross-linking. Water viscosities of the sulfonation products were somewhat lower at comparable molecular weights of base polymer when vinyltoluene was present in the polymer.

As a synthetic gum, the sulfonation products should find use as aqueous thickeners, impregnants, adhesives, textile sizes and in soil conditioning. IEC, 46, #11, 11/54, p. 2435

14.1.2. Ehrlich, et al, discuss casting resins containing polystyrene. Electrical and physical properties of FN-2.5 and other resins are reviewed. A continuing program of development of new styrene-type casting resins is directed toward obtaining improved performance of high-impedance electronic devices.

A new fumaronitrile-styrene copolymer, FN-2.5 casting resin, is the latest member of this series. Its properties have been measured, together with those of an acrylonitrile-styrene copolymer (AN-5 casting resin), a dichlorostyrene-styrene copolymer (NBS casting resin), and polystyrene itself. At high temperatures, the losses of the resins with strong polar groups became much larger than those of polystyrene, and were shown to depend on concentration of both plasticizer and crosslinking agent. However, up to 85° C., FN-2.5 casting resin, and NBS casting resin remained adequate dielectrics over a wide frequency range.

FN-2.5 can be cured in a shorter period of time than NBS resin, and, therefore, permits easier processing in the production of potted parts. IEC, 47, #2, 2/55, p. 322

14.1.3. Vaidya and Kapur present a review on polystyrene. He discusses the preparation and storage of monomer, the preparation and compounding of polystyrene, and properties and applications of polystyrene. PI, 5, #3, 6/55, p. 23

14.1.4. Electric conductivity of polystyrene, polyethylene, and Teflon under β-irradiation has been studied, by Feng and Kennedy, by investigation of the potentials produced by the passage of β-rays through the dielectrics. A potential of 60 kv. has been produced in a single stage and 88 kv. in two stages.

Irradiation of polystyrene by β-particles is found to cause degradation if air is present, but to cause further polymerization if air is excluded. Bombardment of polystyrene in a helium atmosphere by deuterons caused extensive cross linkage. JACS, 77, #4, 2/20/55, p. 847

14.1.5. Mehta reviews recent developments in polystyrene and modified polystyrene plastics. PI, 5, #4, 7/55, p. 29

14.1.6. Wall & Brown discuss the use of deuterium to investigate the extent of branching in polystyrene. The extent of branching is attributed to a polymer transfer step occurring during polymerization. JPS, 14, #78, 12/54, p. 513

14.1.7. Hoffman & Zimm studied the rate of thermal diffusion of polymer molecules in solution. These experiments were carried out on fractionated samples of polystyrene dissolved in either toluene or butyl acetate. JPS, 15, #80, 2/55, p. 405

14.1.8. Tobolsky and Offenbach determined kinetic constants for styrene polymerization. JPS, 16, #82, 4/55, p. 311

14.1.9. Teyssie, et al, discuss the ionic chlorination of polystyrene. The structure of the ionically chlorinated polystyrenes has been investigated by both chemical and infrared spectrometric analyses. JPS, 16, #82, 4/55, p. 429

14.1.10. Frank & Mark present an extension of a previously published account of measurements on four polystyrene fractions. It deals with measurements carried out in several laboratories on one polystyrene faction distributed under the sponsorship of the Commission on Macromolecules of the International Union of Pure and Applied Chemistry. JPS, 17, #83, 5/55, p. 1

14.1.11. The relation between molecular size and weight for polystyrene in cyclohexane at 34, 43, and 57° C. and toluene at 20° C. has been determined, by Notley & Debye, by a light scattering method. JPS, 17, #83, 5/55, p. 99

14.1.12. A composition of matter comprising polystyrene and from 0.1% to 5% by weight of polystyrene of a compound taken from the group consisting of resorcinol dibenzoate and resorcinol disalicylate, said composition being characterized by stability against deterioration upon weathering and exposure to ultraviolet light. USP 2,704,749

14.1.13. The Monsanto Chemical Company issued 11-page Bulletin D5-10 describing Lustrex—water soluble resins.

cf:

1.2.19
2.1.10
3.1.10
9.1.5
23.1.25
27.17.4
32.1.4
32.2.2
32.2.7
32.2.9
32.2.12
32.2.18
32.2.24
37.8.3
37.11.1
38.1.12
38.2.23
38.4.14
38.7.4
38.10.1

Manufacturers:
Bakelite Company
Borden Co., Chemical Division
Dow Chemical Company
Emerson & Cuming, Inc.
Firestone Plastics Company
Koppers Company, Inc.
Marbon Chemical Division
Monsanto Chemical Company
Pennsylvania Industrial Chemical Corp.

CHAPTER 15

ROSIN AND ROSIN DERIVATIVES

15.1.1. Meyer reviews the naval stores outlook. Rosin, turpentine and tall oil are discussed. APJ, 39, #11, 11/29/54, p. 54

15.1.2. A systematic study, by Kamath and Shetye, of the effect of varying the dielectric constant of the solvents used for dissolving the resin, the indicator, type of alkali etc., has shown that precise values can be obtained by titrating solution of a derivative in a mixture of toluene or benzene and 95% ethyl alcohol with 0.1 N alcoholic KOH using bromothymol blue as internal indicator. Rosinated maleics have to be titrated with sodium methoxide in toluene-methanol solution. PI, 5, #1, 4/55, p. 73

15.1.3. A new primary acid of the abietic type, named palustric acid, has been isolated (by Loeblick, et al) from gum rosin by means of partition chromatography. The physical constants and ultraviolet absorption spectrum have been obtained. JACS, 77, #10, 5/20/55, p. 2823

15.1.4. A composition for use as a nonslip coating consisting of chiefly wood rosin and hydroabietyl alcohol, the mixture being dissolved in organic solvent and wherein said rosin comprises at least about 50% by weight of the wood rosin-hydroabietyl alcohol constituent, the proportionate amount by weight of rosin to hydroabietyl alcohol varying from about 1:1 to 5:1 respectively. USP 2,698,250

cf:
23.8.5
Manufacturers:
American Cyanamid Company
Crosby Chemicals
Glidden Co., Naval Stores Division
Hercules Powder Company
Newport Industries, Inc.
C. J. Osborn Company
Reichhold Chemicals, Inc.
G. S. Ziegler & Company

CHAPTER 16

SILICONES

16.1.1. Hedlund reviews the silicones. Straight and modified types show application in the formulation of heat-, weather-, and corrosion-resistant finishes. Vehicles used, formulation, uses, modified silicone resins, and range of properties are discussed. PVP, 44, #11, 11/54, p. 61.

16.1.2. Rose reviews silicones-properties and uses in 16-page Materials and Methods Manual No. 113. In the last decade, a new group of materials has emerged from the laboratories to become part of our everyday lives. They are the silicon-base polymers, and they may be found in a multitude of industrial and consumer products ranging from aircraft gaskets to auto polishes. This manual describes the significant properties and the most important current applications of the "silicones", including:

a. silicone fluids and compounds
b. silicone resins
c. silicone rubbers

MM, 41, #2, 2/55, p. 109

16.1.3. McGregor discusses the structure and properties of silicones. The unique properties of silicones result from the inherent properties of the siloxane bond. The siloxane structure is stable to oxidation, although it is susceptible to rearrangement at somewhat elevated temperatures. Its polarity results in an ability to orient on many types of surfaces such as metals, glass, and textiles. The freedom of rotation of the silicon-oxygen linkage allows linear molecules to assume a helical form; the gradual opening of this helix with increasing temperatures is responsible for the good temperature-viscosity slopes of the liquids. Other properties may be superimposed by the choice of type and amount of organic groups attached to silicon. The selection of the average degree of functionality present in the monomers can bring about further alterations, as can the technique of polymerization. Through all these changes the siloxane bond maintains a sturdy framework. IEC, 46, #11, 11/54, p. 2323

16.1.4. Fortess discusses silicone resins in textiles. Apparel fabrics require finishing treatments to enhance their general performance and to overcome specific shortcomings for special end uses. The silicone resins based on liquid methylsiloxane polymers containing reactive groups for subsequent cross linking on the fabric have been found to impart durable water repellancy, resistance to aqueous-borne stains, increased tear strength and abrasion resistance, and improved sewability, as well as recovery from wrinkling. The relationships of the resin structure to the properties imparted to the fabric is described. Optimum application conditions and sources of difficulties are outlined. IEC 46, #11, 11/54, p. 2325

16.1.5. Currie discusses the effect of alkyl and aryl groups attached to silicon in polysiloxane fluids, including an explanation of why methyl and methylphenyl-polysiloxones are the most important silicone fluids from a commercial standpoint. These fluids are used in the production of greases, compounds, and emulsions; as a liquid spring; as a component of a nonflammable hydraulic fluid; and as constituents of protective creams and ointments. IEC, 46, #11, 11/54, p. 2331

16.1.6. Glaser reviews silicones in protective coatings. Silicone polymers are finding ever increasing applications in the protective coatings industry. The major uses at this time are in the design of heat resistant, heat and corrosion resistant, and weather resistant coatings. These coatings are used for painting structures like smoke stacks, automotive and aircraft exhaust equipment, stoves, furnaces, space heaters, and incinerators. In these instances, the silicone finishes have replaced either more conventional organic finishes or inorganic finishes, formulation guides for the development of a number of types of silicone-based protective coatings are presented, and the durability of the resultant finishes is discussed. Manufacturers of protective and decorative coatings look forward to greatly increased usage of polysiloxanes as new polymers become available. IEC, 46, #11, 11/54, p. 2334

16.1.7. Pfeifer describes compounding principles of silicone rubbers. Silicone rubber gums provide the rubber industry with new polymeric materials useful for compounding in rubbers, which extend the application of elastomeric materials. Rubbers can be made that are flexible below—100°F and that will withstand service as high as 600°F. Good electrical properties with excellent resistance to ozone are obtainable. IEC, 46, #11, 11/54, p. 2342

16.1.8. Walker & Van Lear review silicones in naval shipboard electrical equipment. Silicone insulation was investigated for possible shipboard applications because of its unique thermal and moisture resistance properties. By utilizing this new family of ma-

terials the electrical designers have been able to achieve 30% savings in weight and space. The increased moisture resistance of silicone insulated equipment has also resulted in greater reliability of the equipment. Military specifications have been written to cover silicone materials, as well as cable and equipment utilizing silicones. The availability and utilization of such specifications have done much to allow the military as well as the industrial users to obtain uniform products. IEC, 46, #11, 11/54, p. 2345

16.1.9. Homeyer, et al, describe silicone molding resins. An evaluation of silicone molding compounds for Army-Navy electrical connector inserts has shown that new type compounds have been developed that prevent insulation failure at very high humidity, at very high temperature, and from electrical arcing. IEC, 46, #11, 11/54, p. 2349

16.1.10. Bailey & Pines report on an investigation to study the reactivity of allylic chlorosilanes, and to determine their usefulness in preparing silicones containing allylic groups. IEC, 46, #11, 11/54, p. 2363

16.1.11. Vapor pressures for 20 silicon compounds were measured by Jenkins and Chambers for use in plant design calculations. The range of pressure varies within 20 and 760 mm of mercury. The constants of the Antoine equation $\log_{10}P_{mm} = A - B/(t+c)$ are given for each compound. IEC, 46, #11, 11/54, p.2367

16.1.12. Jenkins & Reid determined the thermal conductivity of liquid silicon compounds. Thermal conductivities at approx. 32°C are presented for 23 silicon and organosilicon compounds. Values for these compounds all fall in the range of 2.4×10^{-4} to 3.7×10^{-4} cal./(sec.) (sq. cm) (°C./cm) for diamyldichlorosilane and vinyltriethoxysilane respectively.

The apparatus described is simple and easy to construct. Results are of sufficient accuracy for engineering purposes. IEC, 46, #12, 12/54, p. 2566

16.1.13. Goldblum and Moody undertook to determine the heat of combustion of octamethylcyclotetrasiloxane, and extended the work to include 11 other organosilicon compounds.

Because of difficulty in obtaining complete oxidation in the oxygen bomb calorimeter, the combustions were carried out in the sodium peroxide bomb calorimeter after suitable calibration.

The accuracy of the heat of combustion data for the 12 organosilicon compounds is within about ± 1%. IEC, 47, #4, 4/55, p. 847

16.1.14. Osthoff, et al, used a study of the chemical stress-relaxation of polydimethylsiloxane elastomers to elucidate the catalytic behavior of acids and bases toward siloxane rearrangement reactions. It has shown that acids and bases both catalyze a siloxane rearrangement reaction which causes stress-relaxation to occur. It was also found that water and carbon dioxide contribute to the rate of siloxane rearrangement, in the presence of acids or bases in the siloxane elastomer. JACS, 76, #18, 9/20/54, p. 4659

16.1.15. From a relatively narrow range of baked-on coatings, silicones have moved into hundreds of formulations. CPVM, 28, #11, 11/54, p. 28

16.1.16. Silicone-based paints and enamels are capable of providing good resistance to heat, and the future for these products in many special applications seems to be assured. There is, however, considerable scope for further research into the use of these materials at high temperatures, the formulation of paints manufactured from them, and the possibility of their use in the fields hitherto associated with vitreous enamels. PM, 24, #11, 11/54, p. 387

16.1.17. Stebleton and Hedlund review the use of silicones in the paint industry. PIM, 69, #10, 10/54, p. 14

16.1.18. Filled systems of high molecular weight dimethylpolysiloxanes at low volume loadings were studied, by Warrick, to clarify the behavior of fillers as reinforcing agents in silicone rubber.

Basically their rheology may be described by a single curve of reduced viscosity vs. reduced rate of shear for each given fluid, obtained by superposition of capillary extrusion data as suggested by Ferry for dynamic viscosity data. IEC, 47, #9, 9/55, p. 1816

16.1.19. Sommer & Ansul have synthesized four organosiloxanes conforming to the general formula $Me_3SiO(Si.Me_2CH_2CH_2CH_2CH_2SiMe_2O)_nSiMe_3$ with n=1, 2, 3 and 4. A study of the physical properties of these substances has shown that they are intermediate between the linear methylpolysiloxanes and the paraffin hydrocarbons. JACS, 77, #9, 5/5/55, p. 2482

16.1.20. Sommer, et al, describe the synthesis and properties of three families of organopolysiloxane diesters. The physical property data lead to the important conclusion that the presence of organic ester functions in the end-groups of linear organopolysiloxanes does not interfere with the "organosiloxane" properties conferred on these substances by the presence of Me_2SiO units in the main chain. JACS, 77, #9, 5/5/55, p. 2485

16.1.21. Barry, et al, studied low-polymer organosilsesquioxanes $(R\ Si\ O_{3/2})_n$ which were prepared by alkali-catalyzed siloxane rearrangement of organotrichlorosilane hydrolyzates. JACS, 77, #16, 8/20/55, p. 4248

16.1.22. Hedlund reports on new developments in silicone resins for protective coatings. PIM, 70, #9, 9/55, p. 17

16.1.23. The swelling of a cross-linked polydimethylsiloxane in a number of swelling agents has been measured by Bueche. Values of the solvent-polymer interaction parameter have been computed. The magnitude of the solubility parameter of the polymer depends markedly on the swelling agents and method used for its estimation. The values reported here range from 7.7 to 5.03. JPS, 15, #79, 1/55, p. 97

16.1.24. Price & Bianchi, studying the structure of polysiloxanes, discuss the influence of solvent on size and polymer-solvent interaction of linear polydimethysiloxane. JPS, 15, #80, 2/55, p. 355

16.1.25. Charlesby studied viscosity measurements in branched silicones. It was found that the reciprocal bulk viscosity decreases uniformly with degrees of branching (or cross linking) until the gel point, when the weight-average and bulk viscosity become infinite. JPS, 17, #85, 7/55, p. 379

16.1.26. A synthetic resin that is an ester (1) a substance whose molecule contains at least one silicon atom to which at least one hydroxy group is attached, and to which at least one hydrocarbon group is attached by a carbon-silicon linkage, with (2) a fatty acid-modified condensation polymer of the class consisting of reaction products of (*a*) an epihalohydrin in which the halogen atom has an atomic weight between 35 and 80 with (*b*) a dihydric phenol, and reaction products (*a*) such an epihalohydrin with (*b*) a sulfonamide whose molecule has at least two hydrogen atoms each connected to a sulfonamide nitrogen atom, the amount of substance (1), on a fully condensed basis, being from 25 to 75 per cent of the total weight of the synthetic resin. USP 2,695,276

16.1.27. A process of preparing from a hydrocarbon substituted polysiloxane, a liquid suitable for use as a varnish which comprises, subjecting to intimate grinding in the presence of absorbed hydrocarbon solvent, a hydro-carbon-substituted polysiloxane gel having a R:Si ratio within the range of about 1.6 to 1.75, wherein R is the hydrocarbon radical, said polysiloxane gel being too highly polymerized to dissolve in said hydrocarbon solvent, said grinding transforming said polysiloxane gel into said liquid. USP 2,706,187

16.1.28. As a composition of matter a siloxane resin having the general formula

$$\frac{R_nSiO_{4-n}}{2}$$

wherein R is a monovalent hydrocarbon radical selected from the group consisting of methyl and phenyl radicals and *n* has an average value of 1.25 to 1.40 inclusive, said resin consisting essentially of 15 to 37.5 mol per cent $CH_3SiO_{3/2}$ units, 20 to 38 mol per cent of diorganosiloxane units selected from the group consisting of $(CH_3)_2SiO$ and $C_6H_5(CH_3)SiO$ units, there being no more than 15 mol per cent $(CH_3)_2SiO$ units, 25 to 45 mol per cent $C_6H_5SiO_{3/2}$ units and 2 to 15 mol per cent $(C_6H_5)_2SiO$ units. USP 2,706,190

16.1.29. The General Electric Company issued 4-page data sheet on SR-60, a silicone resin.

cf:
1.2.16
32.2.11
38.4.1

Manufacturers:
Dow Chemical Corporation
General Electric Company
Linde Air Reduction Company
Plaskon, Barrett Div., Allied Chemical & Dye Corp.
Schenectady Varnish Company

CHAPTER 17

UNSATURATED POLYESTERS

17.1.1. Dean & Manasia discuss the stabilization of polyesters to light. Tests described in this article show that light of wavelengths below 390 millimicrons is very destructive while above this value it is almost inactive. A suitable stabilizer for polyesters must meet a number of conditions:

1. high absorption capacity for the ultra-violet region of the solar spectrum from 290 to 390 millimicrons.
2. ability to dissipate absorbed energy in a manner that neither physically damages the polyester nor produces color.
3. stability against self-destruction by absorbed energy.
4. compatibility with the polyester, both uncured and cured.
5. water insolubility.
6. freedom from odor as well as color. MP, 32, #6, 2/55, p. 131

17.1.2. The Rohm & Haas Company issued 8-page bulletin describing Paraplex P-444, a new polyester resin offering resistance to discoloration on exposure to ultraviolet light, freedom from fiber evidence, and resistance to erosion on outdoor exposure.

cf:
4.1.5
17.3.1
21.1.3
23.11.5
24.8.3
38.7.1
38.8.5

Manufacturers:
American Cyanamid Company
Archer-Daniels-Midland Company
Bakelite Company
Cargill, Inc.
Celanese Corporation of America
General Electric Company
Hooker Electrochemical Company
Interchemical Corporation
Naugatuck Chemical
Ohio-Apex Division
H. H. Robertson Company
Reichhold Chemicals, Inc.
Rohm & Haas Company
Schenectady Varnish Co.
Shell Chemical Corporation

17.2.1. The persulfate-initiated polymerization of allyl acetate has been studied, by Meehan, et al, at 70° C. in the absence and in the presence of sodium lauryl sulfate. In the absence of the detergent a polymer of molecule weight of about 800 is formed from initially homogeneous reaction mixtures at an initial rate approx. proportioned to concentration of persulfate and approx. independent of concentration of monomer. With a separate phase of monomer the molecular weight is about 1000. The addition of the detergent does not increase the rate of initiation or affect the molecular weight of the polymer formed in initially homogeneous media, although the rate of polymerization is increased somewhat. With a separate phase of monomer the polymer formed in the presence of detergent has a molecular weight of about 1300. JPS, 13, #68, 2/54, p. 113

17.2.2. Starkweather, et al, discuss heat-resistant allyl resins. In many thermosets, such as the polymer of diallyl phthalate, crosslinks are wasted through cyclization.

In this paper, the theoretical aspects of crosslink distribution are discussed, and several practical methods for effective crosslinking are described.

Copolymers of thiallyl cyanurate and diethylene glycol bisallyl carbonate possess an outstanding combination of properties. These resins are hard and tough, and do not deform irreversibly at temperatures as high as 200° C. IEC, 47, #2, 2/55, p. 302

17.2.3. Haward studied the polymerization of diallyl phthalate. Using a simple statistical model, the probability of intramolecular reaction is calculated for the polymerizing diallyl phthalate molecule. The calculation is based on the assumption of the free rotation of bonds and a restriction of the chains considered to 9 and 11 links. JPS, 14, #78, 12/54, p. 535

cf:
4.1.5

17.3.1. Rose reviews new polyester-isocyanate synthetics which are being produced as: elastomers with excellent oil and abrasion resistance, foam plastics with close density control, and coatings with high toughness and wear resistance. They provide air drying lacquers of high luster and extreme toughness. They will be useful in applications where excellent wear resistance is required. The electrical and physical properties are excellent and their moisture resistance is better than that of most current finishes now in use. MM, 41, #3, 3/55, p. 112

cf:
4.1.5

CHAPTER 18

VINYLS

18.1.1. McKnight reviews the vinyl resins. These resins offer a combination of properties for formulating primers and finishes having good toughness and adhesion, moisture-, salt spray-, chemical-, and solvent-resistance. The following are discussed:

A. Primers
   1. baking primers
   2. wash primer
   3. low-temperature baking primer

B. Intermediate and finish coats

C. Organosol finishes PVP, 44, #44, #11, 11/54, p. 64

18.1.2. As a part of a general study of the utilization of fatty derivatives in plastics, copolymers of vinyl chloride with vinyl stearate and other vinyl esters were prepared and their mechanical, thermal, viscoelastic, and viscous properties were determined by Port, et al. The study was undertaken to determine whether true plasticization (impartation of flexibility without irrecoverable flow) could be achieved by copolymerization and whether the length of the acyl chain of the comonomer affects the efficiency of internal plasticization.

Copolymers of vinyl chloride containing less than about 25% vinyl stearate have improved properties in some respects as rigid vinyls, because they have lower milling temperatures and a lower melt viscosity-temperature coefficient. Copolymers containing 30 to 50% of vinyl stearate are flexible and resemble compositions of polyvinyl chloride and external plasticizers in their mechanical and thermal characteristics.

Both the rigid and flexible types may be useful for extrusion, because they are preplasticized. A long acyl chain is desirable because as the acyl chain length is progressively decreased from C_{18} to C_2, the internal plasticizer efficiency decreases progressively. IEC, 47, #3, 3/55, p. 472

18.1.3. Pritchard, et al, discuss polyvinyl-pyridine emulsifiers for polymerization in acid media. Vinyl pyridine polymers and copolymers are useful emulsifiers for acidic polymerizations of styrene, butadiene, acrylonitrile, and other monomers. They allow superior process control and high reaction rate while yielding a product free of emulsifiers and nonpolymeric contaminants. IEC, 47, #4, 4/55, p. 863

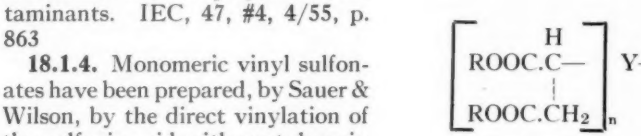
18.1.4. Monomeric vinyl sulfonates have been prepared, by Sauer & Wilson, by the direct vinylation of the sulfonic acid with acetylene in yields of 50-75%. Vinyl methanesulfonate has been homopolymerized and copolymerized with a variety of vinyl monomers. JACS, 77, #14, 7/20/55, p. 3793

18.1.5. When polymers of two different species are dissolved in a common solvent the resulting solution usually separates into two phases. Kern & Slocombe discuss phase separation in solutions of vinyl polymers. JPS, 15, #79, 1/55, p. 183

18.1.6. An interpolymer of styrene and a polyester of dehydrated castor oil acids and an esterifiable glyceryl polyether of 2,2-bis (4-hydroxyphenyl) propane having alternating glycerol radicals and the hydrocarbon radicals of the phenol united in a chain by ether oxygen atoms between said radicals and having a molecular weight of about from 1400 to 1600, said polyester having said dehydrated castor oil acids and said esterifiable glycerol polyether present in an equivalent weight ratio of 1 to 2 respectively, and said interpolymer containing from 7% to 35% by weight of polymerized styrene. USP 2,689,834

18.1.7. A clear, hard, resinous copolymer of a monovinyl aromatic compound and the product obtained by esterifying linoleic acid with 1,2-dihydroxy-3-butene. USP 2,698,840

18.1.8. A resionous composition comprising a vinyl chloride polymer plasticized with a condensation product having the formula



in which Y is an aliphatic, monoolefinic hydrocarbon residue of from 9 to 23 carbon atoms, R is an alkyl group of from 1 to 8 carbon atoms, Z is a member of the group consisting of hydrogen and R, and "n" is an integer of from 2 to 4. USP 2,702,791

18.1.9. A composition of matter comprising a chlorine containing vinyl resin and from about 0.5% to about 8.0% by weight, based on said resin, of a stabilizer, said stabilizer comprising an admixture of from about 1 to about 5 parts of a salt of a carboxylic acid of the class consisting of the aliphatic and cyclo-aliphatic carboxylic acids and mixtures thereof with a metal selected from the class consisting of magnesium, calcium, strontium, barium, zinc, cadmium, mercury, tin and lead and from about 1 to about 5 parts of a compound selected from the class consisting of

aliphatic polyhydric alcohols having at least two and not more than nine hydroxyl groups and a boiling point not less than 250° F., esters of aliphatic polyhydric alcohols said esters having at least two and not more than nine hydroxyl groups and a boiling point not less than 250° F. and ethers of aliphatic polyhydric alcohols said ethers having at least two and not more than nine hydroxyl groups and a boiling point not less than 250° F. USP 2,711,401

cf:
1.2.6
2.1.1
2.1.3
2.2.2
25.7.4
27.3.4
27.3.7
30.2.1
32.2.20
38.5.7
38.8.3

18.2.1. Eckey, et al, report on the production of mixed polyvinyl esters of acetic acid and higher fatty acids by ester interchange between polyvinyl acetate and fatty esters. Their properties indicate that some of these products merit attention as materials for use in the drying oil industries. Because of their enhanced drying qualities and greater tolerance of the presence of saturated acid components, in comparison with the corresponding glycerides, they potentially broaden the range of fatty materials utilizable as drying oils. JAOCS, 32, #4, 4/55, p. 185

18.2.2. The production of stabilized vinyl acetate and polyvinyl acetate from acetylene and acetic acid by the British Oxygen Co., Ltd. in England is described. PM, 25, #3, 3/55, p. 111

18.2.3. A study of chain transfer in the peroxide catalyzed polymerization of vinyl acetate in the presence of 14 solvents has been made, by Kapur & Joshi, and chain transfer constants calculated. The dependence of chain transfer activity on the structure is discussed. JPS, 14, #77, 11/54, p. 489

18.2.4. Burnett, et al, discuss the polymerization of vinyl acetate at low temperatures. JPS, 16, #81, 3/55, p. 31

18.2.5. The Bakelite Company issued 12-page Technical Bulletin #223 listing fundamental data on Bakelite Vinyl Acetate Resins.

18.2.6. The Borden Company issued 2-page Bulletin M-17 describing Polyco 541, alkali-soluble vinyl acetate copolymer beads.

cf:
2.1.1
27.17.3
37.11.1
37.11.2
38.5.6
Manufacturers:
Bakelite Company
The Borden Co., Chemical Div., Polyco Dept., and Monomer Dept.
The Colton Chemical Company
Crownoil Chemical Co., Inc.
E. I. Dupont de Nemours & Co., Inc.
Monsanto Chemical Company
National Starch Products Inc.
Paisley Products, Inc.
Shawinigan Products Corporation

18.3.1. De Coste & Wallder discuss the weathering of polyvinyl chloride. For telephone equipment, vinyl coatings are proving excellent for indoor use, are desirable for outdoor applications. Formulations are reported with excellent outdoor weathering properties; light shielding pigments are important.

Polyvinyl chloride systems have been examined in which the stabilizer, plasticizer, and pigmentation have been varied. Each of these factors exerts a strong influence on weather resistance. Stabilizers and pigments with a high opacity to the transmission of actinic radiation provide the best protection. Such a stabilizer is dibasic lead phosphite, and suitable pigments are fine particle size channel blacks and titanium dioxide.

Low volatility monomeric plasticizers show a satisfactory degree of permanence for long outdoor service provided they are adequately shielded from photoradiation. Resistance to photooxidation is an important feature of a plasticizer, and a laboratory prescreening test is useful in eliminating questionable materials. IEC, 47, #2, 2/55, p. 314

18.3.2. Versatile, low-cost process, and astute engineering feature General Tire's new Ashtabula resin plant, which will produce 25 million lbs. per year of polyvinyl chloride by suspension polymerization. CE, 62, #7, 7/55, p. 128

18.3.3. Cotman studied the reduction of polyvinyl chloride to a hydrocarbon polymer. Polyvinyl chloride reacts with lithium aluminum hydride-lithium hydride in boiling tetrahydrofuran to yield a polyhydrocarbon. From the infrared spectrum of the product it was concluded that the product is quite similar to polyethylene. JACS, 77, #10, 5/20/55, p. 2790

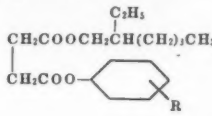
18.3.4. Data are given, by Alford and Dole, for the specific heat of powdered and annealed L-38 polyvinyl chloride over the temperature range −20 to 120°. The glass transition is shown to be pronounced, indicating the amorphous nature of the polymer. JACS, 77, #18, 9/20/55, p. 4774

18.3.5. The variation of elastic modulus and mechanical tan δ with temperature and frequency have been studied, by Maeda, for polyvinyl chloride, natural rubber, Hycar OR-15, GR-S65, and GR-I using pulsed ultrasonic waves of 2.67 and 8.01 MC. Tricresyl phosphate and dioctyl phthalate were used as plasticizers for polyvinyl chloride. JPS, 18, #87, 9/55, p. 87

18.3.6. A process for the production of vinyl chloride polymers that compound easily and readily with plasticizers which comprises dispersing vinyl chloride by agitating the same in an aqueous solution containing a salt selected from the group consisting of the alkali metal and ammonium salts of an at least partially esterfied polyvinyl alcohol in which part of the hydroxyl groups are esterfied by acetic acid and part are esterified by at least one poly-basic acid which contains two carboxyl groups attached to adjacent carbon atoms, and no more than one hydroxyl group, and which, when unsaturated, is of cis formation, and thereafter polymerizing the thus dispersed vinyl chloride. USP 2,705,226

18.3.7. In a process for manufacturing vinyl chloride from actylene and hydrochloric acid gas, the steps of passing a reaction mixture containing acetylene, hydrochloric acid gas, and free chlorine accidentally present in the latter, over a nickel chloride catalyst to convert the free chlorine into an innocuous chlorinated acetylene derivative and subsequently forming vinyl chloride by passing the reaction mixture and the derivative over a mercuric chloride catalyst. USP 2,705,732

18.3.8. A resinous composition comprising a vinyl chloride polymer plasticized with an ester having the general formula



U. S. Patent 2,709,691

in which R is an alkyl radical of 9 carbon atoms. USP 2,709,691

cf:
18.1.2
18.4.2
18.7.1
20.1.2
20.1.4
20.2.1
20.2.2
20.2.3
20.2.5
24.8.2
27.5.2
27.17.3
37.8.3
Manufacturers:
Bakelite Company
Diamond Alkali Company
Dow Chemical Company
Firestone Plastics Company
General Tire & Rubber Company
B. F. Goodrich Chemical Company
The Goodyear Tire & Rubber Co., Inc.
Monsanto Chemical Company
Naugatuck Chemical

18.4.1. This report consists of a tabulated schedule of data plus a narrative report amplifying the information in the table. Consideration is given in an introduction to general considerations affecting organic barriers with respect to surface preparation, principle reasons for failures, application techniques, design factors and testing.

The body of the report specifically about polyvinyl chlor-acetates summarizes properties, discusses compounding variations, resistance to water, inorganic and organic acids; oxidizing conditions, alkalis, salt solutions, temperature limitations, impact and abrasion resistance, hardness, aging characteristics, toxicity, weight of coatings vs thicknesses, electrical properties, coverage and shipping data, flammability and toxicity, surface preparation and application methods. C, 10, #10, 10/54, p. 349

18.4.2. Rideout discusses vinyl resin solutions and dispersions for industrial metal protection. The use of vinyl resins in this country has climbed from about one million pounds in 1939 to an estimated 450 million pounds in 1954 with about 80% of the latter figure being vinyl chloride type resins. The end of this steep climb is not in sight, especially as a number of new films announce their plans to build new production facilities.

Vinyl copolymer properties, solvents for vinyl coatings, hot spray application for plant maintenance painting, plasticizers, pigmentation, primers, and organosol coatings are discussed. OD, 27, #365, 6/55, p. 322

18.4.3. The Bakelite Company issued 30-page Technical Release #6 describing Bakelite resin VAGH, a partially hydrolyzed copolymer of vinyl chloride and vinyl acetate.

cf:
18.7.1
20.2.2
27.17.3
Manufacturers:
Bakelite Company
Firestone Plastics Company

18.5. (No abstracts)

cf:
37.11.2
Manufacturers:
Bakelite Company
The Borden Co., Chemical Div., Monomer Dept.
E. I. Dupont de Nemours & Co., Inc.

18.6. (No abstracts)

cf:
27.17.4

18.7.1. Whitemore discusses thermoplastic resins in surface coatings. An ideal surface coating resin should be non-flammable, non-toxic, heat stable, light stable, colorless, have low viscosity at 100% solids, and be easily polymerized under definite and reproducible conditions to a predetermined hardness or flexibility, either as an air dry or a baked finish. Wash primers, underwater marine systems, polyethylene and plastisols and organosols are included. OD, 27, #362, 3/55, p. 167

18.7.2. Brockmann & Muller describe a new method for the rapid detection of polyvinyl butyral using acidified iodine/potassium iodide solution. PM, 25, #7, 7/55, p. 254

18.7.3. A composition of matter comprising polyvinyl butyral and from 0.05 to 5% of 2-imidazoline-2-thiol based on the weight of the polyvinyl butyral. USP 2,700,028

cf:
27.3.7
Manufacturers:
Bakelite Company
Monsanto Chemical Company

18.8.1. Sheet polyvinyl formal can be formed using rubber compounding techniques, can be improved by crosslinking, should find use in many electrical insulating problems. Sprung, et al, discuss the thermal properties of cured polyvinyl formal sheet.

Polyvinyl formal, modified with a cresol-formaldehyde resin and heat cured, is still more stable toward both physical and chemical changes than the unmodified polyvinyl formal. IEC, 47, #2, 2/55, p. 305

Manufacturers:
Monsanto Chemical Company

18.9.1. A transparent film comprising essentially a vinylidene chloride copolymer containing from 80% to 94% of vinylidene chloride as the sole film-former and, based on the weight of said copolymer, from 0.2% to 1.0% of a fatty acid containing from 16 to 18 carbon atoms, and 0.05% to 2.0% of finely divided calcium carbonate.

A slip agent comprising essentially 2 to 10 parts of an ester wax, 2 to 10 parts of a fatty acid containing from 16 to 18 carbon atoms, and 0.5 to 20 parts of finely divided calcium carbonate. USP 2,711,996

cf:
2.1.10
27.3.7
27.17.4
Manufacturers:
Dow Chemical Company

CHAPTER 19

EMULSION POLYMERS

19.1.1. Pufahl reviews raw materials for new latex paint vehicles. Following an introduction and a brief look at the markets, the author discusses raw materials, characteristics of the monomers, Carbide monomers, selection of monomers for the paint field, selection of basic monomer starting points, acrylic esters, maleic esters, vinyl esters, crotonic acid, new vinyl esters, and vinyl crotonate. APJ, 39, #3, 10/4/54, p. 76

19.1.2. Davis discusses the problems of interior and exterior resin-emulsion coatings. Includes—introduction, classification of latices and resin emulsions, polymers requiring post plasticizer addition, polymers which are internally plasticized, water resistance of high polymer resin-emulsion films, freeze-thaw stability of high polymer resin-emulsions, interior latex-emulsion wall paint, viscosity drift in interior latex-emulsion paints, effect of latex stabilizers, influence of pigmentation, effect of vehicle modifiers, exterior latex-base masonry coatings, and conclusion. POCR, 117, #21, 10/21/54, p. 16

19.1.3. Alexander reviews emulsions. He discusses adsorption and desorption of stabilizing agents, the structure of the stabilizing layer in emulsions, and the thermodynamic stability of emulsions. JOCCA, 38, #3, 3/55, p. 129

19.1.4. The application of polymerization theory to the particular case of emulsions is reviewed, by Cutter, outlining the mechanism of the emulsion polymerization process, the techniques used and the physical properties of the resultant products. The importance of being able to control the chemical stability, viscosity and mechanical stability of the emulsions is indicated. PM, 24, #10, 10/54, p. 337

19.1.5. Turner describes the relationship between composition and mechanical properties of films deposited from high-polymer emulsions. PT, 19, #214, 7/55, p. 229

19.1.6. Turner discusses aspects of the development and evaluation of vinyl polymer emulsions. Polyvinyl acetate, polystyrene, and styrene-butadiene are included. JOCCA, 38, #9, 9/55, p. 526

19.1.7. A dispersion which comprises a resinous polymer of trifluorochloroethylene and a waxy polymer of trifluorochloroethylene as a plasticizer dispersed in a liquid dispersing medium comprising water and a water soluble wetting agent of the class consisting of alcohols having not more than 8 carbon atoms per molecule, ketones having not more than 6 carbon atoms per molecule and substituted polyethylene oxides having not more than 30 carbon atoms and having at one terminus a substituent group of the class consisting of alkylphenoxy groups and thioalkyl groups, the concentration of plastic in the total dispersion being between about 10 and about 35 per cent by weight, and the concentration of plasticizer in the total aqueous dispersion being between about 10 and about 25 per cent by weight, said dispersion having been formed by directly admixing a powdered polymer of trifluorochloroethylene having a particle size between about 0.1 and about 10 microns in diameter and said plasticizer in finely divided form with said liquid dispersing medium. USP 2,686,767

19.1.8. A dispersion which comprises finely-divided particles of the plastic polymer of trifluorochloroethylene dispersed in 2, ethoxy-ethanol, 1 as a dispersant and xylene as a diluent, said dispersion having been formed by directly admixing a powdered plastic polymer of trifluorochloroethylene with said dispersant and said diluent. USP 2,686,770

19.1.9. A water-resistant gypsum composition comprising a set mass of interlaced gypsum crystals that are coated with a petroleum base asphalt containing dispersed therein minute paraffin wax particles rendering the coating substantially non-wettable by water, the total amount of said asphalt and wax not exceeding about 15% by weight thereof, the ratio of asphalt and wax being within the range of from about 2 to about 10 parts of asphalt to each part of wax, an alkalinized water-insoluble protein and also a small amount on the order of from about 0.5% to about 4% of the trisodium salt of a trinaphthalene-dimethylene trisulfonic acid.

A water-resistant paper-covered sheathing board having a core consisting of the composition as defined in claim 3. USP 2,699,414

cf:
1.2.6
25.7.1

19.2.1. Wells reviews acrylate copolymer emulsions and considers some of their products. PM, 25, #6, 6/55, p. 224

19.2.2. The Rohm & Haas Company issued 42-page Progress Report #2 describing Rhoplex AC-33 for Exterior Paints. Also, 2-page bulletin describing Rhoplex B-85 and 3-page bulletin describing Rhoplex X-52.

GEN-FLO* LATEX

now as near as your phone!

Boston, Massachusetts
The Truesdale Company
Allston, Massachusetts
STadium 2-0550

Buffalo, New York
James O. Meyer & Sons
MAdison 5300

Chicago, Illinois
The Cary Company
CEntral 6-1426

Cincinnati, Ohio
M. J. Daly Company
Ludlow, Kentucky
JUniper 7046

Cleveland, Ohio
Henry L. Grund, Inc.
CHerry 1-7336

Davenport, Iowa
Thompson-Hayward Chemical Co.
DAvenport 2-0015

Denver, Colorado
Thompson-Hayward Chemical Co.
KEystone 4-1281

Des Moines, Iowa
Thompson-Hayward Chemical Co.
DEs Moines 3-8151

Detroit, Michigan
D. H. Osgood Company
TExas 4-4161

Kansas City, Missouri
Thompson-Hayward Chemical Co.
TAlbot 2473

Little Rock, Arkansas
Thompson-Hayward Chemical Co.
FRanklin 5-6446

Louisville, Kentucky
C. L. McGuire & Company
MAgnolia 7375

Memphis, Tennessee
Thompson-Hayward Chemical Co.
MEmphis 5-7561

Minneapolis, Minnesota
Thompson-Hayward Chemical Co.
MAin 5394

New York, New York
John H. Calo Co., Inc.
WHitehall 3-6866

Omaha, Nebraska
Thompson-Hayward Chemical Co.
WEbster 4700

Wichita, Kansas
Thompson-Hayward Chemical Co.
AMherst 5-9606

Philadelphia, Pennsylvania
Van Horn, Metz & Co., Inc.
Conshohocken, Pennsylvania
COnshohocken 6-4500

Pittsburgh, Pennsylvania
E. E. Zimmerman Company
ATlantic 1-9373

St. Louis, Missouri
Harry A. Baumstark & Co.
Mission 7-1234

Tulsa, Oklahoma
Thompson-Hayward Chemical Co.
TUlsa 54-6169

Gen-Flo latex sales agents are now located in 21 key areas of the country. This means faster, better service on all Gen-Flo orders no matter where they are placed.

Quality and quantity production of Gen-Flo are now backed up by this network of service-conscious sales representatives. Why not investigate the many advantages of Gen-Flo latex today? Give your nearest sales agent a call.

Chemical Division
GENERAL
THE GENERAL TIRE & RUBBER CO.
GEN-FLO

*T. M. G. T. & R. Co.

cf:
1.2.15
3.1.1
19.1.2
19.1.6
21.3.6
26.4.5
26.4.7
28.1.4
28.2.1
34.3.10
Manufacturers:
Borden Co., Chemical Div., Polyco Dept.
Rohm & Haas Company
Union Bay State Chemical Co., Inc.

19.3.1. The Monsanto Chemical Company issued 30-page Product Information Bulletin #1002 describing Lustrex styrene latices and resins.

cf:
2.1.1
19.1.2
19.1.6
24.8.1
37.3.7
Manufacturers:
Bakelite Company
Borden Co., Chemical Div., Polyco Dept.
Koppers Company, Inc.
Monsanto Chemical Company
Union Bay State Chemical Co., Inc.

19.4.1. Morrison & Terry review polyvinyl acetate emulsion paints. There are many physical differences in the various types of polyvinyl acetate emulsions available. These differences have a marked effect on compounding and performance properties of finished paints made from them. Following a discussion of physical differences between various polyvinyl acetate emulsions, the authors discuss compounding techniques, the pigmentation system recommended, recomendations for color paints, applications of PVA paints, and a discussion of primer sealers. OD, 27, #360, 1/55, p. 10

19.4.2. Tompkins discusses vinyl acetate copolymers and externally plasticized polyvinyl acetate in water-based paints. This is one of the papers read during the panel discussion on polyvinyl acetate emulsion paint systems at the annual meeting of the Federation of Paint and Varnish Production Clubs in Chicago. APJ, 39, #15, 12/27/54, p. 60

19.4.3. Conrad presents results of critical pigment volume concentration studies of polyvinyl acetate emulsions. Results show:

1. Internally plasticized PVAC because of its inherently better film forming properties has given best binding characteristics.
2. film fusion additives (such as hexylene glycol) which are fugitive significantly improve binding properties.
3. with a straight polyvinyl acetate, the addition of a plasticizer and a film fusion additive does increase binding power, but the values obtained are lower than those obtained with internally plasticized emulsions.

POCR, 117, #20, 10/7/54, p. 11

19.4.4. Goldberg clarifies polyvinyl acetate and copolymer terminology. He emphasizes the significance of the essential differences between the plasticized polyvinyl acetates and the internally plasticized polyvinyl acetate copolymers. APJ, 39, #34, 5/9/55, p.82

19.4.5. Preliminary results of an investigation by Barnett & Griffiths, into plasticizer behavior in polyvinyl acetate emulsions are described. A measure of plasticizer efficiency has been obtained from the changes in apparent second-order transition temperature brought about by different plasticizers, and from relation of these changes to the scrub-resistance, wash-resistance and mechanical properties of the film. According to criterion, dibutyl phthalate and di-butoxyethyl phthalate are "efficient" plasticizers, tritolyl phosphate is intermediate and chlorinated diphenyl is comparatively inefficient. To obtain the optimum properties for DBP plasticized films in the pigmented and clear state a plasticizer level of about 15 per cent is required. JOCCA, 38, #6, 6/55, p. 300

19.4.6. Bondy discusses theoretical and practical aspects of vinyl emulsion paints. PM, 25, #3, 3/55, p. 109

19.4.7. Bondy discusses aspects of polyvinyl acetate emulsion paints. The function of each component of an emulsion paint, and the manner in which different materials combine to determine the behavior of the system as a whole, are discussed, with special reference to the role of hydrophilic colloids.

The aggregating effect of hydrophilic colloids on eight commercial polyvinyl acetate emulsions is described, and the analogy with the behavior of natural rubber latex pointed out.

The formulation of a generally acceptable emulsion paint calls for many compromises because very often one set of desirable features can only be achieved at the expense of another. JOCCA, 38, #9, 9/55, p. 503

19.4.8. Polyvinyl acetate emulsion paints are normally manufactured by compounding a plasticized p.v.a. emulsion with a pigment paste. The ancillary agents used in the pigment paste comprise wetting agents, dispersing agents and viscosity stabilizers, and their effect on the dispersion of the pigments and paint characteristics is discussed, by Fletcher and Wilson. Suggestions are made for overcoming difficulties in the formulation of pastel and deep-shade emulsion paints. JOCCA, 38, #9. 9/55, p. 544

19.4.9. A process for preparing a stable aqueous emulsion of polyvinyl acetate comprising polymerizing vinyl acetate in an aqueous emulsion in the presence of from about 0.1% to about 2.0% of a fatty acid ester having a carbon chain length of from 9 to 24 carbon atoms and containing an SO_3 group, the fatty acid portion of said ester having a carbon chain length of 8 to 18 carbon atoms, a catalyst selected from the class consisting of peroxy and persulfate catalyst, from about 0.001% to about 0.9% of an aliphatic mercaptan, from about 0.001% to about 0.005% of a complex inorganic cyanide compound selected from the class consisting of sodium ferricyanide, potassium ferricyanide, sodium ferrocyanide and potassium ferrocyanide and from about 1.0% to about 10.0% polyvinyl alcohol. USP 2,694,052

19.4.10. The Bakelite Corporation issued 24-page Temporary Technical Bulletin #225 covering Bakelite Vinyl Acetate Resin Latex WC-130; coating formulation data. Also Release #1: Exterior Paints based on Bakelite Vinyl Acetate Resin Latex WC-30.

19.4.11. The Celanes Corporation of America issued New Product Bulletins NP-12 and NP-14 describing Emulsions CL-100 and CL-202. The former is a homopolymer while the latter is a copolymer.

19.4.12. The Colton Chemical

Company issued: 9-page bulletin PVB#501A describing Vinac Polyvinyl acetate emulsions, 1-page bulletin #PVB 506 describing Vinac P-100 paint grade polyvinyl acetate emulsion, and 10-page bulletin #PVB-514 describing Vinac Flexbond 800.

19.4.13. E. I. duPont de Nemours & Company, Inc., issued 6-page bulletin V3-355 describing "Elvacet" polyvinyl acetate water emulsions. Also Bulletin V15-455 describing "Elvacet" 81-900 polyvinyl acetate emulsion as an exterior and interior paint vehicle.

19.4.14. Reichhold Chemicals, Inc., issued 12-page Technical Bulletin SC-9 describing 9301 Wallpol PVA Emulsion.

19.4.15. The Shawinigan Resins Corporation issued 2-page Technical Bulletin No. 10100 listing formulation for Gelva Emulsion Paint 243 Exterior White.

cf:
1.2.15
19 1.2
21.3.6
21.5.2
26.4.5
26.4.7
28.1.1
28.1.3
28.1.4
28.3.1
34.4.2
37.3.7
37.10.1

Manufacturers:
Bakelite Company
Borden Co., Chemical Div., Polyco Dept.
Celanese Corp. of America
The Colton Chemical Company
Dewey & Almy Chemical Company
E. I. Dupont de Nemours & Co., Inc.
Jones-Dabney Company
Monsanto Chemical Company
National Starch Prods. Inc.
Nopco Chemical Company, Inc.
Paisley Products, Inc.
Reichhold Chemicals, Inc.
Shawinigan Products Corp.

19.5.1. Hague discusses emulsified chlorinated natural rubber for water thinnable paints. Known as PE-16, it makes possible for the first time all of the well known advantages of chlorinated rubber: great acid and alkali resistance, weathering resistance, and water resistance in a water thinnable medium. Instead of the characteristic application difficulties it can be applied with the greatest of ease with no need for special thinners. PE-16 clear emulsion can be processed very simply by the paint manufacturer into a finished paint without any of the precautions and adjustments usually required of water-thinnable coatings. It can be readily used as a fortifier or modifier of other aqueous dispersions to lessen water sensitivity and to eliminate or lessen foaming and other difficulties. OD, 27, #365, 6/55, p. 350

19.5.2. Alfred Hague & Co., Inc. issued 8-page Bulletin #551 describing PE-16 Clear, emulsified chlorinated natural rubber for the paint industry.

Manufacturers:
Alfred Hague & Co., Inc.

19.6.1. Cargill, Incorporated issued 15-page bulletin describing Cargill EVT-50, a styrene-butadiene latex, modified with an oleoresinous polymer. Also issued—2 supplements listing formulations.

19.6.2. The Firestone Plastics Company issued 8-page Sales Service Bulletin #B-4 describing Firestone Butaprene Paint Latices for Styrene-Butadiene Latex Paints.

19.6.3. The General Tire & Rubber Company issued 12-page Bulletin GFL-2 describing Gen-Flo Paint Latex.

19.6.4. The B.F. Goodrich Chemical Company issued 38-page technical report: "A Theory of Latex Loading".

cf:
2.1.1
19.1.2
19.1.6
21.3.4
26.4.7
28.1.16

You Can Make All These Water-Base Paints with

ELVACET*

POLYVINYL ACETATE EMULSIONS

...and Du Pont will help you with your formulations

You can make a variety of low-cost, durable paints with "Elvacet" polyvinyl acetate emulsions. Primer-sealer, interior and exterior masonry paints can all be formulated with "Elvacet", without special mixing equipment.

Your water-based paints, properly formulated with "Elvacet", will offer these sales advantages:

- **Easy to apply**
- **Fast-drying**
- **Resist fading and yellowing**
- **High moisture-vapor transmission—(Paints can "breathe")**
- **Easy to clean**
- **Alkali-resistant**

Your customers will like the way "Elvacet"-based paints are easily washed from brushes and hands when the job is done—no messy clean-up problem.

Get more information on "Elvacet" and its use in this growing paint field. Just fill out and mail the coupon below.

*REG. U. S. PAT. OFF.

ELVACET
Reg. U. S. Pat. Off.
polyvinyl acetate emulsions
DU PONT
Better Things for Better Living
... through Chemistry

E. I. du Pont de Nemours & Co. (Inc.) PVP-AN
Electrochemicals Dept., Wilmington 98, Del

☐ Please send me more information on "Elvacet" for interior and masonry paints.
☐ Please have your representative call with suggested formulations.

Name_____ Position_____
Firm_____
Address_____
City_____ State_____

RESOFLEX R-296

The only truly compatible, resinous, non-volatile and non-migrating PLASTICIZER for POLYVINYL ACETATE

. . . now widely used by leading manufacturers of

ADHESIVES
LAMINATIONS
HEAT-SEAL COATINGS
BINDERS FOR NON-WOVEN FABRICS
BOOKBINDING GLUES
COATED PAPER AND FABRICS
GREASE-PROOF PAPER AND FIBERBOARD
WATER EMULSION PAINTS
FACE AND BACKING COATINGS FOR LINOLEUM
BACKING COMPOUNDS FOR RUGS AND CARPETS
WASHABLE SIZES FOR TEXTILES

RESOFLEX has...

- ESSENTIALLY ZERO VOLATILITY
- NO PLASTICIZER MIGRATION
- EXCELLENT RESISTANCE TO OILS·FATS·GREASES·GASOLINE
- EXCELLENT FLEXIBILITY AND TOUGHNESS

Cambridge Industries Co.
101 Potter Street
Cambridge 42, Mass.

Please send me a laboratory sample of Resoflex R-296 and technical literature.

Name.....
Company.....
Address.....
City.....State.....

Manufacturers:
Borden Co., Chemical Div., Polyco Dept.
Cargill, Inc.
Dow Chemical Company
Firestone Plastics Company
General Latex & Chemical Corporation
General Tire & Rubber Company
The Goodyear Tire & Rubber Co., Inc.
Koppers Company, Inc.
Rubber Corporation of America

19.7.1. Bosch, et al, review stress-strain properties of films of pigmented or emulsified alkyds. This is a reprint of an article published in the Official Digest. For details see 4.1.3. APJ, 39, #13, 12/13/54, p.75

cf:
4.1.3
37.3.7

19.8.1. Tensile strength of elastic films prepared from neoprene latex was investigated by Anderson & Kovacic, in order to find methods for obtaining optimum tensile strength in films made from old latices.

The polymer molecules in a latex particle become linked together as the latex ages. The number of crosslinks formed is related to the decrease in tensile strength of films prepared from old latices. These crosslinks form between tertiary allylic chlorines on the polymer chains, which are also the normal curing sites. Semi-quantitative relationships are established among the number of active positions, the number of crosslinks, the latex age, the time of cure, and the tensile strength.

The tensile strengths of films from aged latices can be raised by using tetraethylthiuram disulfide as an auxiliary vulcanizing agent. Application of the principles and methods developed will lead to the preparation of latex films having optimum physical properties. IEC, 47, #1, 1/55, p. 171

Manufacturers:
The Borden Co., Chemical Div., Resinous-Reslac Dept.
E. I. Dupont de Nemours & Co., Inc.

19.9. (No abstracts)

cf:
19.1.2
21.5.2
Manufacturers:
Dow Chemical Company

19.10. (No abstracts)

Manufacturers:
Dow Corning Corporation
General Electric Company

19.11. (No abstracts)

cf:
19.1.2
Manufacturers:
B. F. Goodrich Chemical Company

19.12.1. The Pennsylvania Industrial Chemical Corporation issued 8-page Bulletin SIC 2851-F describing Piccopale A-1 Emulsion Paints. Also, 3-page bulletin describing Piccopale Emulsions.

Manufacturers:
Pennsylvania Industrial Chemical Corp.

19.13.1. Schoon & van der Bie studied the particle size distribution in brominated Hevea latices. JPS, 16, #81, 3/55, p. 63

Manufacturers:
The General Tire & Rubber Company
Rubber Corporation of America

19.14.1. Weeks, discussing asphalt emulsions as protective coatings, provides some practical information about the nature and use of these emulsions. Asphalt is probably the most widely used single coating material for the protection and preservation of buildings and industrial plants. Emulsions of asphalt, and in particular those of the mineral colloid or clay type, have now taken an important position in this broad function served by asphalt. They provide the modern approach both extending the sphere of application and making these applications easier to perform. POCR, 117, #23, 11/18/54, p. 17

19.14.2. Weeks discusses asphalt emulsions. Early supplies are reviewed. Chemical composition is discussed. Troublesome characteristics of asphalt include—property of cold flow, tendency to crack and alligator under weather conditions, equipment requirements involved in application, and unattractive color. How these problems have been overcome by emulsification is discussed. Their limitations are discussed and a summary of their properties and benefits is presented. CPVM, 29, #3, 3/55, p. 8

19.15.1. The Chemical Products Corporation issued product data sheet on their epoxy resin emulsion.

Manufacturers:
Chemical Products Corporation

CHAPTER 20

PLASTICIZERS

20.1.1. Plasticizers are largely dependent upon the plastics industry. A large portion of what isn't used for vinyl chloride goes mostly into other vinyls and cellulosics. Yet there are important other uses for plasticizers, particularly for military purposes, that help to create uncertain and unpredictable markets. This analysis of plasticizer production in 1953 is an effort to separate the amount of plasticizer business dependent upon vinyl chloride from all other miscellaneous classifications in order to show the dependency of one upon the other. MP, 32, #2, 10/54, p. 108

20.1.2. A method is given by Wartman, for predicting certain properties of plasticized vinyl chloride resin compounds which contain more than one plasticizer. The method is shown experimentally to be applicable to brittle temperature, SPI volatility, plasticizer rub-off and nitrocellulose marring. These properties of the mixed plasticizer compound are related in a simple manner to the concentrations of the individual plasticizers and to the values of each of these same properties in compounds containing the individual plasticizers. MP, 32, #6, 2/55, p. 139

20.1.3. Daidone presents water tolerance values of vinyl plasticizers. The order of solvent power of hydrophobic plasticizers with acetone as a reference solvent can be expressed conveniently and precisely by reference to specific water values for equal weight comparison or to molar water value for molecular weight comparison. It is further suggested that this same order persists when considered as solvents for macromolecules. The experience of other workers is cited to show this relationship. Data are presented for 51 plasticizers. MP, 32, #8, 4/55, p. 159

20.1.4. Swern, reviewing plasticizers discusses plasticizers in general, plasticizers for polyvinyl chloride, and plasticizers from fats. JAOCS, 31, #11, 11/54, p. 574

20.1.5. Silverstein, et al, prepared a number of ester-amides and diester-amides of aminoalcohols and evaluated them as plasticizers. Screening tests established the necessity of a secondary amine group in the aminoalcohol to impart the desired degree of compatibility with vinyl resins.

Optimum plasticizer properties were attained with the C_8 and C_{10} diester-amides of diethanolamine. The mixture of caprylic and capric acids as obtained from coconut oil was convenient and economical. JAOCS, 32, #5, 5/55, p. 354

20.1.6. Production of all plasticizers in 1954 amounted to 301 million lb., compared to 293 million lb. in 1953, according to the U. S. Tariff Commission figures. MP, 33, #1, 9/55, p. 97

20.1.7. The Bakelite Company issued Kabelitems #77 describing "Properties of Plasticizers and Their Relation to Electrical Compounding".

cf:
19.4.5
27.5.2

20.2.1. Conyne & Yehle discuss the use of alkyl esters of pinic acid for the plasticization of polyvinyl chloride. Pinic acid is a dibasic acid which may be prepared from readily available α-pinene. As a result, the behavior of esters of pinic acid as plasticizers for polyvinyl chloride is a matter of economic and strategic importance.

The dioctyl and the octyldecyl esters of pinic acid are the most useful of the pinates examined in this study. When used as secondary plasticizers, these esters permit the formulation of elastomeric vinyl compounds that have better flexibility at low temperatures and show lower volatility and soapy water extraction losses than similar compounds containing di-2-ethylhexyl phthalate as the sole plasticizer. The pinic acid esters show either poor permanence properties or limited compatibility when used as primary plasticizers.

If they become commercially available at moderate cost, esters of pinic acid may be useful secondary plasticizers for polyvinyl chloride. IEC, 47, #4, 4/55, p. 853

20.2.2. Loeblich, et al, report on an investigation aimed at screening esters of some of the acids obtainable by stepwise oxidation of α-pinene—namely, pinic, symhomopinic, and β-(hydroxyisopyl) Pimelic acid γ-lactone- for their plasticizing characteristics.

The results indicate that these esters are satisfactory and frequently excellent plasticizers for polyvinyl chloride—polyvinyl acetate copolymers. Although they are somewhat less compatible and not quite so effective with polyvinyl chloride, in most respects their performance as plasticizers is adequate.

Vinyl plasticizers, exhibiting moduli and low temperature characteristics that rival the sebacates can be produced from terpene-derived acids. The cyclic structure of these substances does not necessarily inhibit adequate low tem-

perature plasticization. IEC, 47, #4, 4/55, p. 855

20.2.3. Campbell studied the usefulness of the amates as plasticizers of elastomeric substances. The compounds as a class are relatively unknown despite the fact that they possess the functions of both ester and amide.

The substituted amates are stable liquids readily miscible in most of the elastomers. Natural rubber, GR-S, butadiene-acrylonitrile rubber and polyvinyl chloride polymers were satisfactorily plasticized with these compounds.

The eventual usefulness of these compounds is dependent upon the future economics of the substituted amines. IEC, 47, #6, 6/55, p. 1213

20.2.4. Whitnack, et al, investigated the general behavior of the methyl, ethyl, butyl, and octyl esters of o-phthalic acid, at the dropping mercury electrode. AC, 27, #3, 3/55, p. 359

20.2.5. Knuth & Bruins discuss itaconic acid derivatives as plasticizers for polyvinyl chloride resins. Sugar fermentation has made itaconic acid available in commercial quantities. Some diesters, dibutyl ester polymers, and esterlactams show good plasticizing efficiency. IEC, 47, #8, 8/55, p. 1572

20.2.6. Polaek & Holmstrom discuss "Celluflex" CEF a flame-retardant plasticizer for protective coatings. It has found application in nitrocellulose and ethylcellulose lacquers, shellac, alkyd finishes, and emulsion paints. PVP, 45, #9, 8/55, p. 35

20.2.7. The Carbide & Carbon Chemicals Company issued 4-page F-8521A describing Flexol Plasticizer 77-G and 5-page F-8733 describing Flexol Plasticizer 426.

20.2.8. Godfrey L. Cabot, Inc. issued:

Bulletin #PC-1–Efficiency Factors for Cabot Plasticizers
Bulletin #PC-3–Cabflex Plasticizers in Vinyl Plastisols
Bulletin #PC-4–Cabflex DDP in High Temperature Vinyl Insulation Compounds
Bulletin #PC-5–Commercial Plasticizers and Their Manufacture
Bulletin #PC-6–Water Extraction Properties of Vinyl Plasticizers
Product Data Sheet on Cabflex DDP
Product Data Sheet on Cabflex TCP

20.2.9. The B.F. Goodrich Chemical Company issued service bulletins GP-6 and GP-7 describing Good-Rite phthalate plasticizers and Good-rite adipate plasticizers.

20.2.10. The Monsanto Chemical Company issued a 2-page bulletin on Saniticizer 603—a primary plasticizer for polyvinyl chloride.

20.2.11. Chas. Pfizer & Co., Inc., issued 12-page Technical Bulletin #31 describing Citroflex Plasticizers. These are a series of citric acid esters. Also, Data Sheet #501 on Itaconic Acid Esters.

20.2.12. The Witco Chemical Company issued E-1 and E-4 describing Witco butyl stearate and Witicizer #300 (dibutyl phthalate.)

cf:
20.1.2
20.1.3
38.7.8

Manufacturers:
Advance Solvents & Chemical Corp.
Atlas Powder Company
Baker Castor Oil Company
Barrett Division
Godfrey L. Cabot, Inc.
Cambridge Industries Company
Carbide & Carbon Chemicals Company
Commercial Solvents Corporation
Dewey & Almy Chemical Company
Diamond Alkali Company
Eastman Chemical Products, Inc.
Emery Industries, Inc.
Harchem Division
Hercules Powder Company
Monsanto Chemical Company
National Lead Company
Ohio-Apex Division
Pan American Chemicals Division
Chas. Pfizer & Co., Inc.
Pittsburgh Coke & Chemical Company
Rohm & Haas Company
Rubber Corporation of America
Witco Chemical Company
Wyandotte Chemicals Corp.

20.3.1. The preparation of the ethyl and butyl esters of soft lac (shellac) and whole lac is described, by Kamuth and Nagarsenkar, and the possibility of using them as plasticizers, particularly for cellulose nitrate lacquers, has been investigated. PI, 5, #1, 4/55, p. 101

20.3.2. The Barrett Division issued 2-page report #553 describing BRC 21 Hydrocarbon, a new thermoplastic type plasticizer.

20.3.3. The Rohm & Haas Company issued 2-page bulletin on Paraplex G-61, a high molecular weight- plasticizer.

cf:
4.1.5
20.1.2
20.1.3

Manufacturers:
Baker Castor Oil Company
Barrett Division
Cambridge Industries Company
Cargill, Inc.
Diamond Alkali Company
Emery Industries, Inc.
General Electric Company
Harchem Division
Hercules Powder Company
Monsanto Chemical Company
Ohio-Apex Division
Pan American Chemicals
Pittsburgh Coke & Chemical Company
Rohm & Haas Company
Rubber Corporation of America

20.4. (No abstracts)

cf:
20.1.2

Manufacturers:
Archer-Daniels-Midland Company
Baker Castor Oil Company
Pacific Vegetable Oil Corporation

CHAPTER 21

GENERAL PIGMENTS

21.1.1. Kamath & Potnis review lake colors. The importance of the base in the manufacture of lake colors is emphasized and it has been shown that by proper choice of the base, pretreated if necessary, superior performance can be obtained with acid, basic or mordant dyes. The use of casein as precipitant for acid dyes and shellac for basic dyes, results in improved performance, the latter giving comparable results with PTM lakes. The relation between the color of alizarine lakes and the position of the precipitating metal in the periodic table has been investigated. PI, 3, #11, 2/54, p. 25

21.1.2. Jones discusses the coloring of fluorocarbons. Included are triflurochloroethylene, tetrafluoroethylene, pigment consideration, pigment selection, dry-coloring molding powder, color concentrates, coloring extrusion resins, coloring dispersion coatings, coloring inks for marking, and conclusion. Five references cited. MP, 32, #2, 10/54, p. 111

21.1.3. Cowee and Moffett, discussing colors for polyesters, review methods of adding color (paste concentrates, dry powders, dyes, and pigmented polyester resins), colorant properties, pigmentation problems, conclusions. MP, 32, #2, 10/54, p. 113

21.1.4. Brouillard describes American contributions to phthalocyanine technology. After briefly tracing history of the phthalocyanines, the main American technological processes are outlined with a description of recent attempts to expand the spectrum of these pigments. PM, 25, #4, 4/55, p. 143

21.1.5. Williams & Conley review the use of molybdenum in organic pigments. Its most important uses lie in the complex acids—phosphomolybdic and phosphotungstomolybdic. These acids along with phosphotungstic acid constitute a group of precipitating agents for several classes of basic and other dyestuffs that produce three valuable related classes of pigments known as phosphomolybdic acid (PMA) colors, phosphotungistic acid (PTA) colors, and phosphotungstomolybdic acid (PTMA) colors. IEC, 47, #8, 8/55, p. 1507

21.1.6. Hein & Pierce discuss new pigments from 3, 3'-dichloro-and 3, 3'-dimethoxy-4, 4'-diaminostilbene. The new pigments show bathochromic color shifts as expected when compared with the corresponding pigments from 3, 3'-dichlorobenzidine. The differences in the visual light absorption curves are explained. JACS, 77, #14, 7/20/55, p. 4107

21.1.7. Le Bras, et al, studied the flooding and floating of titanium dioxide-iron blue enamels. OD, 27, #368, 9/55, p. 607

21.1.8. A paste pigment composition containing finely divided particles of a ferrous metal, wetted and coalesced with a wetting agent comprising 25 to 80 per cent of liquid chlorinated polyphenyl, having a chlorine content of not more than approximately 60 percent to form soft, or plastic pigment compositions having unusual utility. USP 2,713,006

21.1.9. E. I. DuPont de Nemours & Co., Inc., issued 8-page Technical Service Bulletin #20—Dupont Pigment Colors for Emulsion Paints. Also 18-page Technical Service Bulletin #21—Dupont Pigment Colors for Plastics.

21.1.10. Kohnstamm & Co., Inc., issued 64-page Color Chart covering colors for protective and decorative coatings.

cf:
26.2.3
26.4.7
38.1.3
38.10.3

21.2.1. The urge of India is self-sufficiency. The paint industry will have to fall in line sooner or later. An exploration of indigenous raw materials is an urgent necessity. This specially contributed article goes into the fundamentals and indicates the versatile uses of zinc oxide. PI, 4, #1, 4/54, p. 61

21.2.2. A study has been made, by Lasko and White, of the surface roughness of titanium dioxide pigment particles, as well as the fuzziness developed upon the addition of various amounts of unpolymerized and polymerized linseed oils, used as despersants. In some instances, the nonuniform adsorption of these oils indicates the heterogeneous nature of the particle surface. The need for the use of controlled amounts of dispersant when studying the intrinsic surface characteristics of particulate materials is indicated. Specimen contamination by the action of the electron beam is shown to be absent under the conditions employed in this study. AC, 26, #10, 10/54, p. 1631

21.2.3. The development of after-treatment for titanium dioxide pigments is discussed by Taylor, and a typical flow sheet diagram is given. The improvement in pigment properties effected by the removal of oversize particles, surface treatment and washing are illustrated by fineness-of-grand, viscosity and flow measurements on

FOR YOUR EVERY PAINT REQUIREMENT

Du Pont White and Color Pigments

PHTHALOCYANINE BLUES

MONASTRAL® PHTHALOCYANINE PIGMENTS

BT-284-D. A full strength pigment highly resistant to crystallization and flocculation.

BP-192-D. A water dispersible pigment for resin-emulsion and latex base paints.

BT-297-D. A green-shade, full strength pigment that produces attractive two-tone effects when metallized.

BW-372-P. A standardized water paste for emulsion paints.

"RAMAPO" PHTHALOCYANINE PIGMENTS

BP-173-D. A resinated pigment that offers easier grinding and lower paint consistency.

BP-366-D. Get *highest* flocculation resistance at *lowest* cost with this new high strength pigment.

PHTHALOCYANINE GREENS

MONASTRAL®	"RAMAPO"
GT-674-D	GP-501-D

Blue-tone greens with brilliance and strength, great stability and chemical inertness.

MONASTRAL®	"RAMAPO"
GT-751-D	GP-755-D

Yellow-tone greens that give greater blending flexibility—permits a range of brighter greens.

MONASTRAL® GW-749-P. A standardized water paste for emulsion paints.

MOLYBDATE ORANGES

YE-421-D. A high quality pigment having exceptional masstone brilliance and tinting strength; also a versatile blending pigment.

YE-637-D. Unsurpassed resistance to darkening from exposure—essential where the ultimate in lightfastness is needed.

SHADING YELLOW

Y-493-D. Just this *one* Shading Yellow—blended with standard Milori Blues—is all you need to produce greens fully equal in quality to the more expensive Chrome Greens.

CHROME YELLOWS

LIGHT	"EXCELSIOR"	MEDIUM
Y-433-D	Y-434-D	Y-469-D

Lightfast, brilliant, easy to disperse. These pigments mix readily to provide a smooth, uniform mill base. Careful and complete standardization assures uniform quality.

ZINC YELLOW

Y-539-D. HIGH CHROMATE TYPE—Meets the requirements of all Zinc Yellow specifications. Gives lightfast decorative finishes . . . non-staining in industrial atmospheres.

GREEN GOLD

YT-562-D. Has excellent color retention in full shade, tints and metallics. Produces exceptionally brilliant greens when blended with "Monastral" phthalocyanines.

WHITE PIGMENTS

TI-PURE® RUTILE TITANIUM DIOXIDE

R-110. Excellent color and high gloss make this grade desirable for high grade industrial enamels and interior architectural finishes.

R-510. This grade is chalk-resistant and has outstanding dispersion properties. It's an ideal all-purpose grade for architectural finishes.

R-610. Has maximum chalk resistance and is used in finishes requiring maximum resistance to fading and chalking.

TI-PURE® ANATASE TITANIUM DIOXIDE

FF. Free-chalking pigment (medium oil absorption). Used in self-cleaning white house paints.

Y-CR. "Semi-chalking" pigment used in outside house paints to control rate of chalking.

LO-CR. Has low oil absorption, good color and gloss. Used in industrial finishes when anatase type color is required.

For more information about Du Pont Pigments, see your Du Pont representative or write to:

E. I. du Pont de Nemours & Co. (Inc.)
Pigments Department Wilmington 98, Del.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

DU PONT
WHITES and COLORS
FOR QUALITY PRODUCTION

pastes and paints made in ball mills, pug mills, and triple-roll mills. The improved results obtained with pigments of lower water-solubles content are illustrated by water dispersion tests and assessment of the blister resistance of metal primers. Natural and accelerated exposure results show that the resistance to chalking of rutile-type pigments is improvement by the after-treatment process. An accelerated chalking method is described. JOCCA, 38, #5, 5/55, p. 233

21.2.4. Robson reviews recent work of laboratories engaged in the field of titanium pigments. The effects of the latest experience with these materials is considered. PM, 25, #1, 1/55, p. 25

21.2.5. Cromer & Herrington have determined the crystal structures of anatase and rutile with greater precision than has been previously reported, using powder data obtained with a Norelco X-Ray diffractometer. The cell parameters, oxygen parameters, and the Ti-O distances were determined and are reported. JACS, 77, #18, 9/20/55, p. 4708

21.2.6. A white pigment stable to actinic radiation consisting of 100 parts of substantially pure zinc sulfide and from 40 to 45 parts of magnesium oxide having a particle size ranging from 0.05 to 0.1 micron. USP 2,711,968

ct:
21 1.7
26.2.3
26.4.7
Manufacturers:
American Cyanamid Company
American Zinc Sales Company
E. I. Dupont de Nemours & Co., Inc.
The Eagle-Picher Lead Company
The Glidden Company
Metal & Thermit Corporation
National Lead Company
The New Jersey Zinc Company
St. Joseph Lead Company
Smith Chemical & Color Company
Titanium Pigment Corporation

21.3.1. King discusses the effect of various extenders in alkyd flat finishes. Wollastonite, a calcium metasilicate mixed and milled at Willsboro, N. Y., is compared to other extenders. Results obtained indicate that Wollastonite is a versatile extender that will by itself contribute to film properties where formerly a combination of two or three extenders were used to achieve the same purposes. Beside flat alkyds, it finds use in house paints, traffic paints, primer surfacers, and water-based paints. OD, 27, #360, 1/55, p. 15

21.3.2. Kaolin processing at the Klondyke Mine of the Mineral & Chemicals Corporation of America in Wilkinson County, Georgia, features a new spray-drying operation. The process is described in this article. PVP, 44, #12, 12/54, p. 31

21.3.3. Rao discusses minerals in the paint industry. The mineral resources of India are enormous, and to the Indian Paint Industry, this offers a unique opportunity for development. The author discusses barytes, iron oxides, whiting, china clay and other aluminum silicates, gypsum, graphite, steatite or ashestive, magnesite, and silica. PI. 4, #1, 4/54, p. 53

21.3.4. Price describes the effect of the particle size distribution and pigment volume concentration of Kaolinite extender pigments on some important properties of various paint systems. Part I covers butadiene-styrene copolymer latex paints and semi-gloss oleoresinous enamels. PVP, 45, #7, 6/55, p. 27

50th Year of Pigment Extenders

ASBESTOL
regular—superfine

325 Mesh. Medium Oil. For Trade Sales and Industrial Finishes, Caulking Compounds.

Excellent Suspension. Easy Grindability.
Low Delivered Prices—Carload Lots or LCL.

MICRO VELVA
Grade "L" for Latex Paints
Grade "A" for Oil Paints

Less Than 1 Micron Average. Cuts Grinding Time by 50%. Cuts Electric Power Costs. Speeds Production. Oil Paints, Latex, Resin Emulsions.

Carbola Chemical Co., Inc.
Mines-Mills-Offices
Natural Bridge, N.Y., U.S.A.

For Technical Data, Samples and Formulations, write to
Technical Service Dept., Natural Bridge, N. Y.

Branches at: West Springfield, Mass.; Carnegie, Pa.; Butler, Ind.; Minneapolis, Minn.; Bird-In-Hand, Pa.; Durham, N. C.; Kingston, Ont., Can.

21.3.5. Schenck describes diatomaceous calcite, a unique extender pigment for the protective coating and allied industries. Reference is made to the method of mining and processing this material, together with the geological history connected with the formation of this extender pigment. The specific properties have been described in detail, indicating how its mode of formation produced a material having these desirable properties and how, by specific example, these properties can be of great advantage in formulating a wide variety of low sheen interior and exterior finishes. OD, 27, #367, 8/55, p. 537

21.3.6. Part II concludes this series of articles, by Price, describing the effect of the particle size distribution and pigment volume concentration of Kaolinite extender pigments on some important properties of various paint systems. This part is concerned with polyvinyl acetate and acrylic emulsion paints. PVP, 45, #8, 7/55, p. 23

21.3.7. Mountsier and Gitter review the use of magnesium silicate of talc in the paint industry. PIM, 70, #5, 5/55, p. 8

21.3.8. Godfrey L. Cabot, Inc., issued:

8-page #CGen-1 describing Cab-O-Sil (Colloidal Silica)

4-page #CMis-2 describing Aqueous dispersions of Cab-O-Sil

3-page #CPai-1 describing Cab-O-Sil as a transparent extender in automotive enamels

4-page #CPai-2 describing Cab-O-Sil for the paint industry

11-page #CPai-3 describing Cab-O-Sil as a flatting agent for varnishes

8-page #WPai-2 describing Wollastonite (Calcium Silicate)

21.3.9. The Wet Ground Mica Association issued Technical Bulletins #20 and 21: "The Modification of Vinyltoluene Oil Copolymer Flat Wall Paints by Wet Ground Mica", and "An Opaque Window Paint Based on the Light-Scattering Effect of Wet Ground Mica".

21.3.10. The Witco Chemical Company issued Bulletin W-2 describing Witcrabs (ppt $CaCO_3$) in polyvinyl chloride resins.

cf:
26.2.3
26.4.7
37.9.3

Manufacturers:
Burgess Pigment Company
Godfrey L. Cabot, Inc.
Carbola Chemical Company
Concord Mica Corporation
The Davison Chemical Corporation
Diamond Alkali Company
Dow Corning Corporation
The English Mica Company
Franklin Mineral Products Company
Georgia Kaolin Company
Great Lakes Carbon Corp., Dicalite, Div.
Hayden Mica Company
J. M. Huber Corporation
Innis, Speiden & Co., Inc.
Johns-Manville Products Corporation
Kraft Chemical Company, Inc.
Mineralite Sales Corporation
Minerals & Chemicals Corp. of America
Monsanto Chemical Company
National Lead Company
Smith Chemical & Color Company
H. C. Spinks Clay Co., Inc.
Tamms Industries, Inc.
U.S. Mica Co., Inc.
R. T. Vanderbilt Company
Westvaco Chemical Division
C. K. Williams & Company
Witco Chemical Company
Wyandotte Chemicals Corporation

21.4.1. Clare summarizes work carried out by C. K. Williams & Co. in providing the paint industry with new tools for consideration and test. It is hoped, that these new materials will enable the paint manufacturer to extend his production with new and improved shades or to make use of some of the more recent dispersion equipment at a greater degree of efficiency than can now be achieved using iron oxide pigments of the prewar types. OD, 26, #357, 10/54, p. 902

You develop the best weathering qualities in a film by

1. Reducing the pigment agglomerates to optimum size, and
2. Putting the pigment particles in a matrix of the binder.

R-B-H dispersions offer you both advantages.

R-B-H . . . *for finishes of integrity.*

R-B-H *Dispersions*

DIVISION OF INTERCHEMICAL CORPORATION
DISPERSION TECHNICIANS
BOUND BROOK, NEW JERSEY

Pigment dispersions in nitrocellulose; ethyl cellulose; urea formaldehyde; vinyl and alkyd resins; chlorinated rubber and other plastic binders.

R-B-H IS A TRADEMARK OF INTERCHEMICAL CORPORATION

look...

it's

TITANOX®

The white coating on these venetian blinds was pigmented with TITANOX-RA—the rutile "pure" titanium dioxide white pigment. Because of its maximum hiding power, TITANOX-RA is especially useful in flexible thin films, on metallic surfaces. On products that must withstand bending or forming—containers, collapsible tubes, etc.—TITANOX-RA is your No. 1 choice in white pigments. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Atlanta 5; Boston 6; Chicago 3; Cleveland 15; Houston 2; Los Angeles 22; Philadelphia 3: Pittsburgh 12; Portland 14, Ore.; San Francisco 7.
In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

3786-A

21.4.2. The Mapico Color Division of the Columbian Carbon Company issued a 30-page book Company issued a 30-page book describing Mapico Colors—iron oxides.

cf:
21.3.3

Manufacturers:
Columbian Carbon Company
Ferro Corporation
Mineral Pigments Corporation
Reichard-Coulston, Inc.
J. Lee Smith & Company
Smith Chemical & Color Company
Tamms Industries, Inc.
C. K. Williams & Company

21.5.1. Wormald studied toluidine red bloom in baked synthetic finishes. Conclusions are as follows;

1. Blooming is directly associated with pigment solubility in vehicle constituents; but its formation is dependent upon the uniformity of rate of through-dry of the paint films.
2. Factors promoting the formation of skin on the surface of the enamel also promote bloom. Accordingly, severe blooming occurs in high temperature baked enamels, particularly those formulated with urea-CH_2O resin wherein the degree of bloom was found to be proportional to the urea—CH_2O resin content.
3. Excellent bloom resistance can be obtained for formulating with melamine—CH_2O resin instead of urea—CH_2O resin.
4. Use of top driers (such as cobalt drier) lowers the bloom resistance of the enamel.
5. Except in extreme cases, bloom does not appear if the freshly baked finish is kept clean and is allowed to cool and age in a well-ventilated fume and vaporfree atmosphere.
6. Polymerization inhibitors (such as copper compounds) lower the bloom resistance of baking enamels containing nitrogen resin.
7. Additional factors contributing to improved bloom resistance include:
   a. Selection of solvents and thinners having a minimum solvency for toluidene red.
   b. Use of a primer which is as highly pigmented or porous as possible.
   c. Use of a soya or dehydrated castor oil modified alkyd in the primer rather than linseed or chinawood oil modified alkyds.
   d. Application of the top coat at minimum film thickness.
   e. Use of low baking temperatures if possible (preferably 275°F. or lower)

OD, 27, #364, 5/55, p. 264

21.5.2. Kronstein, et al, studied the stability of toluidine red in latex paints. The study shows lecithin to be effective in pigment dispersion and redispersion after storage. Vinyl chloride-vinylidine chloride copolymer latex and vinyl acetate copolymer latex were included in this study. PVP, 45, #7, 6/55, p. 36

21.5.3. A light and heat stable red to maroon pigmentary substance consisting essentially of the water-insoluble metallic salts of the azo dyestuff formed upon diazotization of dichloranilinemonosulfonic acid and coupling of said acid with 2-hydroxy-3-naphthoic acid. USP 2,694,055

21.5.4. A red pigmentary substance of improved light and heat stability consisting essentially of the calcium salt of the azo dyestuff formed upon diazotization of dichloroaniline monosulfonic acid selected from the group consisting of 2,3-dichloroaniline-5-sulfonic acid and 3,4-dichloroaniline-6-sulfonic acid, and coupling the said acid with 2-naphthol. USP 2,694,056

Manufacturers:
American Cyanamid Company
Ansbacher-Siegle Corp.
E. I. Dupont de Nemours & Co., Inc.
Ferro Corporation
Fine Colors Company
General Color Company
The Glidden Company
The Harshaw Chemical Company
Hilton-Davis Chemical Co.
Holland Color & Chemical Company
Imperial Paper & Color Corporation
Kentucky Color & Chemical Company
H. Kohnstamm & Co., Inc.
Mineral Pigments Corporation
The Sherwin-Williams Company
Smith Chemical & Color Company
Standard Ultramarine & Color Company
Zinsser & Company

21.6.1. New experimental work, described by Watson & Clay, yielded results that are in general agreement with the theory that the blackening of lead chromes is the result of photo-reduction, but it is considered likely that the oxygen evolved is in the atomic form, and not molecular oxygen as suggested by Lashof.

Improvements recently made in the stability to light of lead chromes are referred to and a tentative suggestion made as to how the treating agents commonly used for this purpose may function. The crystallography of lead chromes involves a change of crystal structure, is corrected. JOCCA, 38, #4, 4/55, p. 167

21.6.2. Huckle & Lalor discuss molybdate orange. This pigment is a deep, reddish orange approaching a light red in hue, and is characterized by brilliancy, high tinctorial strength, very good opacity, good permanency, and excellent application properties. Chemically, molybdate orange is a solid solution of lead chromate, lead molybdate, and lead sulfate. The production of molybdate orange involves all the conventional techniques for the manufacture of chemical precipitated pigments and presents some specialized problems; there is involved not only a three component system but also a metastable system, since the color valuable phase of this material is of different crystal structure from the stable phase of lead chromate. IEC, 47, #8, 8/55, p. 1501

21.6.3. Danziger, reports that latest test data on molybdate orange pigments show light fastness equal to or superior to chrome oranges, ten to sixteen times the tinting strength of chrome oranges, and four to eight times the hiding power of chrome oranges. PIM, 70, #9, 9/55, p. 13

21.6.4. The Sherwin-Williams Company issued Technical Bulletins #C-55 and C-57 describing Yellow for Green 12160, a new chrome yellow pigment, and the formulation of green enamels with yellow for green 12160.

Manufacturers:
American Cyanamid Company
Ansbacher-Siegle Corp.
E. I. Dupont de Nemours & Co., Inc.
Ferro Corporation
Fine Colors Company
The Glidden Company
The Harshaw Chemical Company
Hilton-Davis Chemical Co.
Holland Color & Chemical Company
Imperial Paper & Color Corporation
Kentucky Color & Chemical Company
H. Kohnstamm & Co., Inc.
Mineral Pigments Corp.
The Sherwin Williams Company
Smith Chemical & Color Company
Standard Ultramarine & Color Company
Zinsser & Company

21.7.1. The method of producing a finely-divided, tinctorially strong, non-crystallizing, red shade, beta form metal phthalocyanine pigment which comprises subjecting a phtha-

HIGH QUALITY PIGMENTS for Paints

CARBON BLACKS
for every purpose

NEO-SPECTRA® MARK I NEO-SPECTRA MARK II*	a superior quality black for outstanding jetness.
SUPER SPECTRA®	characterized by fast dispersion, high blackness and gloss. A vehicle-seeking black most used in high quality enamels and lacquers.
NEO-SPECTRA MARK III	a high color black which produces satin finishes with normal gloss in enamels and lacquers.
SUPERBA®	quality with economy. A vehicle-seeking pigment for medium high color finishes.
NO. 999 EXCELSIOR®*	best buy in blacks. More color, dollar for dollar — greater usefulness black for black.
NO. 140	the special utility black.
RAVENS*	the all purpose black — standard for color — good hiding and dispersion — wide application.
	densed form for cleaner handling and less storage space—try the black that contributes better leveling qualities to finishes.
	good covering where low oil absorption is required.

*Available in densed form for ease of dispersion.

IRON OXIDES
Synthetic colors with light stability, high covering power, and acid and alkali stability.

MAPICO® YELLOWS	5 dependable colors, 4 with low oil absorption.
MAPICO REDS	a wide range of pigments providing bright mass tone and a multiplicity of pleasing tints.
MAPICO CRIMSONS	three rich shades which when cut with white produce many desirable tints.
MAPICO TANS	two entirely new iron oxide types on the reddish yellow side, with unusual ability to withstand high temperatures.
MAPICO BROWNS	strong colors which alone produce richer brown paints than any combination of yellow, red and black iron oxides.
MAPICO BLACK	a low oil absorption black for tough finishes and tinting.

COLUMBIAN CARBON COMPANY
380 MADISON AVENUE, NEW YORK 17, N. Y.

locyanine pigment prepared in an autoclave in the presence of a saturated alicyclic hydrocarbon solvent and thereafter acidpasted, to treatment with an aliphatic isocyanate at a temperature of about 90° C. to about 140° C. USP 2,699,440

cf:
21.1.4
Manufacturers:
American Cyanamid Company
Ansbacher-Siegle Corp.
E. I. Dupont de Nemours & Co., Inc.
Ferro Corporation
Fine Colors Company
General Dyestuff Corp.
Hilton-Davis Chemical Co.
Holland Color & Chemical Company
Imperial Color & Chemical Company
Kentucky Color & Chemical Company
H. Kohnstamm & Co., Inc.
Mineral Pigments Corp.
New York Color & Chemical Company
The Sherwin-Williams Company
Smith Chemical & Color Company
Standard Ultramarine & Color Company
C. K. Williams & Company

21.8.1. Shur determined the effect of variation in the composition of the organic dispersing medium upon the flocculation of copper phthalocyanine blue pigment.

Mixtures of dispersions of pigment in mineral oil and raw castor oil with various organic solvent media, as well as direct dispersions of pigment in solvents, were studied. Sedimentation volume, rheological and photomicrographic methods were employed.

Results indicated that the polarity of the dispersing phase is not the sole factor affecting the flocculation of copper phthalocyanine blue pigment. Solvent media alone (in absence of surface active agents) are shown to have profound influence upon flocculative tendencies. Alkyl acetate esters were found to be superior to most other commonly used solvent media in their deflocculative effect on the phthalocyanine blue pigment tested.

Part I is concerned exclusively with the literature survey conducted with this study. PVP,45, #5, 4/55, p. 30

21.8.2. Shur presents part II (conclusion) of his studies on the flocculation of phthalocyanine blue, discussing the experimental work and results of this work. The studies are chiefly concerned with the effect of organic dispersing medium upon the flocculation of copper-phthalocyanine blue. Dispersion of phthalocyanine blue in mineral oil and raw castor oil with various organic solvents as well as direct dispersion of this pigment in various solvents are covered. PVP, 45, #6, 5/55, p. 30

21.8.3. Muhlbauer discusses some aspects of copper-phthalocyanine. Includes production process, properties of copper-phthalocyanine, the polymorphous modification of copper-phthalocyanine, coloristic peculiarities of the alpha form, coloristically valuable copper-phthalocyanine, transformation process, and work on the improvement of stability against solvents of the beta form of copper-phthalocyanine. PI, 4, #11, 2/55, p. 27

cf:
21.1.4
21.1.7
Manufacturers:
American Cyanamid Company
Ansbacher-Siegle Corp.
E. I. Dupont de Nemours & Co., Inc.
Ferro Corporation
Fine Colors Company
General Dyestuff Corporation
Harshaw Chemical Company
Hilton-Davis Chemical Co.
Holland Color & Chemical Corporation
Imperial Paper & Color Corporation
Kentucky Color & Chemical Company
H. Kohnstamm & Co., Inc.
Mineral Pigments Corporation
New York Color & Chemical Company
The Sherwin-Williams Company
Smith Chemical & Color Company
Standard Ultramarine & Color Company
Zinsser & Company

21.9.1. That the anomalous tinting strength values, observed for carbon blacks, can be explained on the basis of the simple hypothesis that the plates of the muller used for working out the carbon white pigments vehicle mixture, for the tinting strength test, are held apart at a constant distance equal to the diameter of the particles in the white pigment, is illustrated by Rose in this paper, which should stimulate further thought and comment on this controversial subject. PM, 25, #6, 6/55, p. 213

21.9.2. Godfrey L. Cabot, Inc., issued Bulletin #SB-3: Procedure for the Determination of Blackness of Extremely Low Reflectance Surfaces.

Manufacturers:
Ansbacher-Siegle Corporation
Godfrey L. Cabot, Inc.
Columbian Carbon Company
Continental Carbon Company
Ferro Corporation
General Carbon Company
J. M. Huber Corporation
Mineral Pigments Corporation
Monsanto Chemical Company
Sid Richardson Carbon Company
J. Lee Smith & Company
Smith Chemical & Color Company
United Carbon Company, Inc.
R. T. Vanderbilt Company
C. K. Williams & Company

21.10.1. A rust inhibitive aluminum pigment paint comprising aluminum flake pigment; strontium chromate, said chromate being used in the varable ratio of 1 part chromate to 4 parts aluminum pigment, to 1 part chromate to 1 part aluminum pigment; and a bodied resinoil vehicle in an amount sufficient to produce a brushable paint. USP 2,701,772

21.10.2. The Metal Powder Association issued Data Sheet #3 listing Metal Powders—Commercially Available Grades and Types.

Manufacturers:
Aluminum Company of America
Magna Mfg. Co., Inc.
Metalead Products Corporation
Metals Disintegrating Co., Inc.
Reynolds Metals Company
Silberline Mfg. Co., Inc.

21.11.1. The arresting character of many signs and advertisements is due to the use of colored inks which are fluorescent. Déribéré considers some of the materials suitable for the purpose and paints out some of the problems in manufacture. PM, 25, #7, 7/55, p. 251

21.11.2. Beck discusses luminescence and related properties, and luminescence in the paint industry. OF, 16, #8, 8/55, p. 5

Manufacturers:
Imperial Paper & Color Corp.
The New Jersey Zinc Company
Rhode Island Labs., Inc.

21.12.1. The experience of over a century of painting shows that there can be no question that Red Lead paint will be supreme in protecting ferrous surfaces, maintains "Pertinox," the author of this article. With the vast projects waiting to be finished, those on the job can take a useful tip or two. PI, 4, #1, 4/54, p. 57

21.12.2. Grupp reports on tests conducted by the Royal Aircraft Establishment of the British Government to determine the efficiency of chromate pigments as anticorrosion agents.

The tests indicate that the best all around protection was given by calcium chromate, strontium chromate, and zinc monoxy-chromate. Good protection was given by potassium zinc chrome and zinc tetroxy-chromate. Fair protection was provided by sodium chrome. OF, 16, #7, 7/55, p. 14

21.12.3. The Lead Industries Association issued Red Lead Technical Letter #9—"Red Lead Paints for Galvanized Steel, Rusted or Weathered or Treated New".

cf:
27.3.2
Manufacturers:
American Cyanamid Company
Ansbacher-Siegle Corporation
E. I. Dupont de Nemours & Co., Inc.
The Eagle-Picher Lead Company
Imperial Paper & Color Corporation
Kentucky Color & Chemical Company
Metalead Products Corporation
Mineral Pigments Corporation
National Lead Company
National Zinc Company, Inc.
The New Jersey Zinc Company
Smith Chemical & Color Company

21.13.1. Hrishikesan discusses the manufacture of aluminum paste, as it is carried out in India. The plant manufacturing aluminum paste is located in Bombay, employs the "Hall Process", and the paste produced conforms to specifications similar to those of foreign manufacturers. PI, 5, #1, 4/55, p. 36

21.13.2. The Bakelite Corporationissued 6-page Release #9 describing colors for vinyl acetate latex paints.

21.13.3. The Sherwin-Williams Company (Pigment, Color & Chemical Division) issued Technical Bulletin #C-58 describing Dispersed Colors for the Paint Industry.

Manufacturers:
Acheson Colloids Company
Acheson Dispersed Pigments Company
Aluminum Company of America
Ansbacher-Siegle Corporation
Carbon Dispersions, Inc.
Claremont Pigment Dispersions Corporation
Fine Colors Company
The Goodyear Tire & Rubber Company
Harwick Standard Chemicals Company
Holland Color & Chemical Company
Jones-Dabney Company
Magna Mfg. Company, Inc.
Marbon Chemical Division
Metals Disintegrating Company, Inc.
Mineral Pigments Corporation
National Lead Company
C. J. Osborn Company
Pennsylvania Color & Chemical Company
Plastics Color Company
R-B-H Dispersions
Reynolds Metals Company
The Sherwin-Williams Company
Silberline Mfg. Co., Inc.
Standard Ultramarine & Color Company
Vansul & Company

21.14.1. Parsons & Seaman have generated titanous ion electrolytically at a mercury cathode in an external electrolysis cell using constant current. The generated reagent has been used to titrate Orange II, tartrazine, p-aminoazobenzene, amaranth, and methyl violet with results in satisfactory agreement with the conventional volumetric titanous chloride titration methods. AC, 27, #2, 2/55, p. 210

21.14.2. Schneid reviews theories relating the fastness properties of colors to their chemical structure. IR, 13, #4, Winter 54-55, p. 101

21.14.3. Brode, et al, studied the hydration of azo dyes in organic solvents. The addition of water to alcoholic solutions of 4-amino, 4-dimethylamino, 4-hydroxy and 4-methoxy substituted azo-benzense gives rise to a new absorption band at a somewhat longer wave length than that of the main absorption band in the visible region, indicating the formation of some new species. This new band is attributed to the formation of a hydrogen bond between the azo group and water. JACS, 77, #10, 5/20/55, p. 2762

cf:
21.1.1
Manufacturers:
American Cyanamid Company
Arnold, Hoffman & Co., Inc.
Berncolors, Inc.
Ciba Company, Inc.
E. I. Dupont de Nemours & Co., Inc.
Eastman Chemical Products, Inc.
General Dyestuff Corporation
National Aniline Division
Peerless Color Company, Inc.

NEW! SOHIO ODORLESS SOLVENT!

Sohio announces a new odorless solvent . . . available now for immediate shipment in drums, tank cars and truck transports from Sohio's Toledo, Ohio Refinery. You'll find Sohio Odorless Solvent has the qualities you need for production of the best odorless paints Its excellent odor and stability characteristics are the result of a special Sohio refining process. For prices and samples, write Solvent Department, SOHIO, Midland Building, Cleveland 15, Ohio, or phone MAin 1-7400.

TYPICAL TESTS

Distillation	(D-86)°F
IBP	356
50%	365
End Point	407
Flash Point (D-56)°F	131
Color (Saybolt) (D-156)	30
Specific Gravity 60/60	0.761

AVAILABLE

in drums, tank cars, truck transports, for immediate delivery from Toledo to these areas

SOHIO

CHAPTER 22

SOLVENTS

22.1.1. Equilibrium data for the system ethyl alcohol-n-heptane-water were obtained during the course of a study of azeotropic distillation.

A ternary diagram complete with tie lines is presented by Schweppe & Lorah. Refractive index and density data for the co-existing phases are included. IEC, 46, #11, 11/54, p. 2391

22.1.2. Manufacturers of solvents show remarkable restraint in keeping production only slightly ahead of consumption. The market is firm though many prices have eased. CE, 62, #3, 3/55, p. 260

22.1.3. Burrell discusses the determination and application of a physical constant, the solubility parameter, describing the solvency characteristics of solvents. IR, 14, #1, Spring '55, p. 3

22.1.4. In part II of Burrell's article on solubility parameters, the author shows how it can explain and rationalize known solubility behavior of polymers. IR, 14, #2, Summer '55, p. 31

22.1.5. Arnold discusses the laws relating to solvents. There is no general law of solvents but solvents are covered under four independent heads—taxation, factory legislation, petroleum legislation and similar enactments, and common law. JOCCA, 38, #2, 2/55, p. 71

22.1.6. Rasmussen has shown that molecular weight, structure, latent heat of vaporization, and boiling range influence the evaporation rates of thinners and solvents. Solvents are always used in the presence of solids, which also have a marked influence on the evaporation rates. Therefore, the only significant evaporation characteristics are those obtained on the finished coatings. OD, 27, #367, 8/55, p. 529

22.1.7. Wright discusses the evaporation of binary and ternary solvent mixtures and their release from lacquer and resin films. PT, 19, #214, 7/55, p. 227

22.1.8. Tyler and Rubenstein discuss odorless thinners and their use in odorless paints. PL, 27, #2, 2/55, p. 14

22.1.9. Waters presents part I of his series on paint thinners from petroleum. Following an introduction he discusses the critical characteristics of petroleum thinners, and the building blocks of petroleum thinners. PIM, 70, #1, 1/55, p. 12

22.1.10. Waters continues his series on paint thinners from petroleum. This third part includes naphthenes and alkyl naphthenes. PIM, 70, #3, 3/55, p. 22

22.1.11. Waters continues his series on paint thinners from petroleum. This fifth part discusses the building blocks of petroleum thinners as they are available to the refiner. PIM, 70, #5, 5/55, p. 13

22.1.12. Waters continues his series on paint thinners from petroleum. This sixth part discusses volatility of petroleum thinners. PIM, 70, #6, 6/55, p. 14

22.1.13. Waters concludes his series on paint thinners from petroleum. This eighth part discusses the Shell alkyd reduction technique. PIM, 70, #8, 8/55, p. 23

22.1.14. Yerger & Barrow studied, by infared spectroscopy, the reactions between acetic acid and diethylamine in carbon tetrachloride and chloroform. Structures for the various ion-pair products have been deduced from the observed spectral changes. These are discussed in terms of their expected stabilities. Interaction with chloroform molecules greatly alters the electronic structure of the ion pairs. JACS, 77, #17, 9/5/55, p. 4474

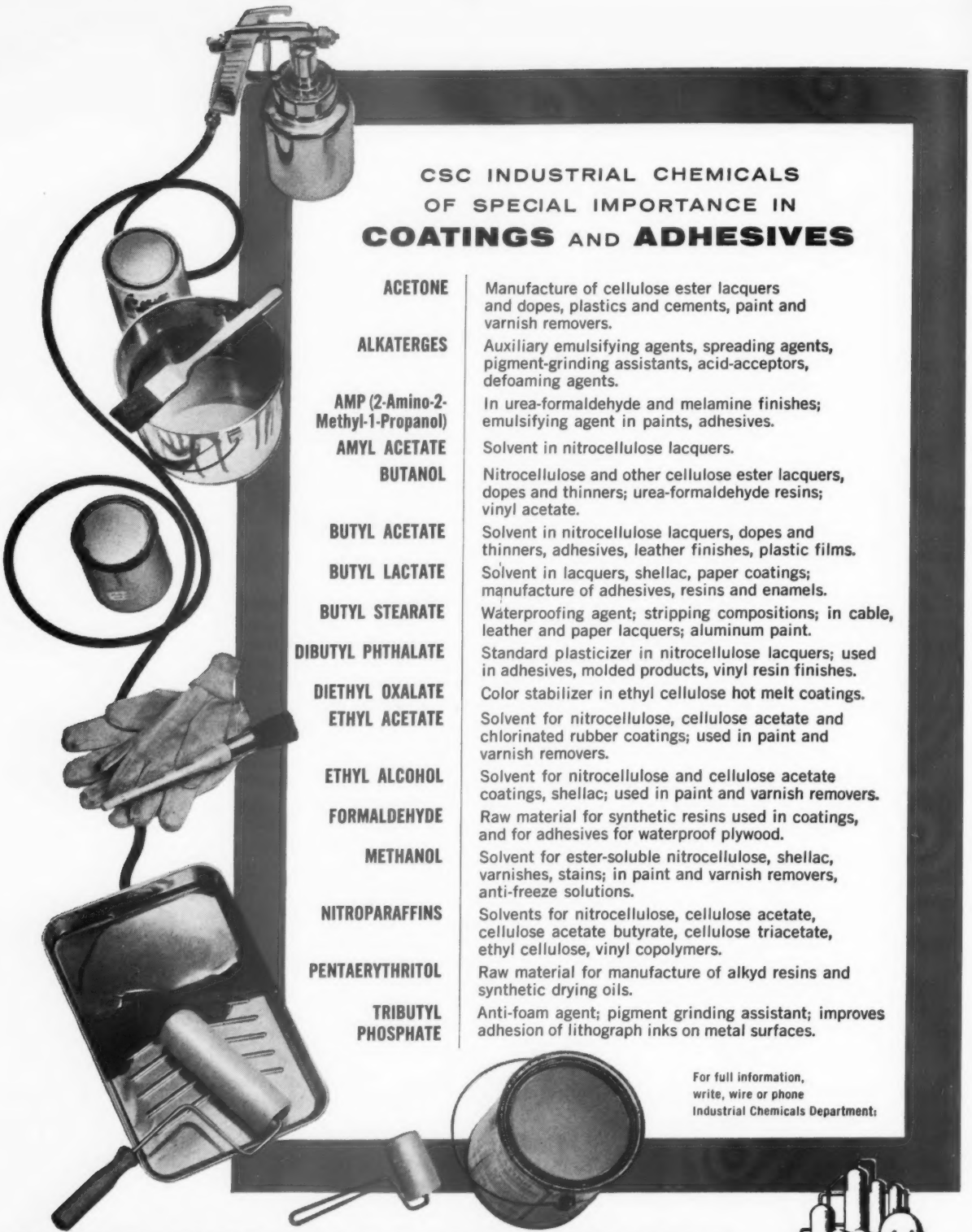
22.1.15. Metcalf discusses the utilization of hydrocarbon solvents and thinners in the coatings industry. Hydrocarbon solvents, whether aromatic or aliphatic and whether produced from petroleum or coal tar sources, are the most economical and universally used components of paints, varnishes, and, lacuqers. OD, 27, #368, 9/55, p. 637

22.1.16. The American Mineral Spirits Company issued 150-page compilation of data sheets on the solvents they produce.

cf:
26.4.7

22.2.1. Waters presents "Odorless Thinners 1954," an appraisal of technological developments of odorless, alkyd oil base formulations. The author presents the response to a questionnaire consisting of 10 questions. Results are too numerous to list here. The outstanding conclusion is that the odorless formulations permit for the first time realization of the superior quality of alkyd paints completely free of solvent odor during application and drying. PVP, 45, #1, 1/55, p. 31

22.2.2. Rittershausen discusses petroleum thinners for the paint industry. Sources, important characteristics, safety, and odor are reviewed. There are three main sources of petroleum naphthas; the aliphatic naphthas, the aromatic and alkylated aromatic hydrocarbons, and the odorless thinners (which are composed of



CSC INDUSTRIAL CHEMICALS
OF SPECIAL IMPORTANCE IN

COATINGS AND ADHESIVES

ACETONE	Manufacture of cellulose ester lacquers and dopes, plastics and cements, paint and varnish removers.
ALKATERGES	Auxiliary emulsifying agents, spreading agents, pigment-grinding assistants, acid-acceptors, defoaming agents.
AMP (2-Amino-2-Methyl-1-Propanol)	In urea-formaldehyde and melamine finishes; emulsifying agent in paints, adhesives.
AMYL ACETATE	Solvent in nitrocellulose lacquers.
BUTANOL	Nitrocellulose and other cellulose ester lacquers, dopes and thinners; urea-formaldehyde resins; vinyl acetate.
BUTYL ACETATE	Solvent in nitrocellulose lacquers, dopes and thinners, adhesives, leather finishes, plastic films.
BUTYL LACTATE	Solvent in lacquers, shellac, paper coatings; manufacture of adhesives, resins and enamels.
BUTYL STEARATE	Waterproofing agent; stripping compositions; in cable, leather and paper lacquers; aluminum paint.
DIBUTYL PHTHALATE	Standard plasticizer in nitrocellulose lacquers; used in adhesives, molded products, vinyl resin finishes.
DIETHYL OXALATE	Color stabilizer in ethyl cellulose hot melt coatings.
ETHYL ACETATE	Solvent for nitrocellulose, cellulose acetate and chlorinated rubber coatings; used in paint and varnish removers.
ETHYL ALCOHOL	Solvent for nitrocellulose and cellulose acetate coatings, shellac; used in paint and varnish removers.
FORMALDEHYDE	Raw material for synthetic resins used in coatings, and for adhesives for waterproof plywood.
METHANOL	Solvent for ester-soluble nitrocellulose, shellac, varnishes, stains; in paint and varnish removers, anti-freeze solutions.
NITROPARAFFINS	Solvents for nitrocellulose, cellulose acetate, cellulose acetate butyrate, cellulose triacetate, ethyl cellulose, vinyl copolymers.
PENTAERYTHRITOL	Raw material for manufacture of alkyd resins and synthetic drying oils.
TRIBUTYL PHOSPHATE	Anti-foam agent; pigment grinding assistant; improves adhesion of lithograph inks on metal surfaces.

For full information,
write, wire or phone
Industrial Chemicals Department:

COMMERCIAL SOLVENTS

260 MADISON AVENUE **CORPORATION** NEW YORK 16, N. Y.

Baltimore 2, Md. • Boston 29, Mass. • Chicago 14, Ill. • Cincinnati 2, Ohio • Cleveland 13, Ohio • Detroit 7, Mich. • Los Angeles 22, Calif.
Louisville 2, Ky. • New Orleans 12, La. • New York 16, N. Y. • St. Louis 17, Mo. • St. Paul 14, Minn. • San Francisco 4, Calif.
IN CANADA: Reliance Chemicals, Ltd., Montreal. IN MEXICO: Comsolmex, S.A., Mexico 11, D. F.

CSC
INDUSTRIAL
CHEMICALS

can a Solvent be "perfect"?

get the answer from a Solvent Survey

It's worth investigating—especially with today's competition. That's where a solvent survey can help you. The lacquer technology section at the Celanese Technical Service & Applications Laboratories can review your formulation, conduct tests, comparisons, prepare cost analyses... and there's no obligation.

Picking the "perfect" solvent is a job for a specialist. Why not get the details from your experienced Celanese representative? Celanese Corporation of America, Chemical Division, Dept. 558-X, 180 Madison Avenue, New York 16, N. Y.

SPECIALIZED

Normal Butanol	Ethylene Glycol Diacetate
Isobutanol	1, 3-Butylene Glycol
2-Ethyl Butanol	2, 3-Butylene Glycol
3-Methoxy Butanol	Dipropylene Glycol
Methanol	Propylene Glycol
Normal Propanol	Acetone
Normal Butyl Acetate	Methyl Ethyl Ketone
Normal Propyl Acetate	Special Solvents

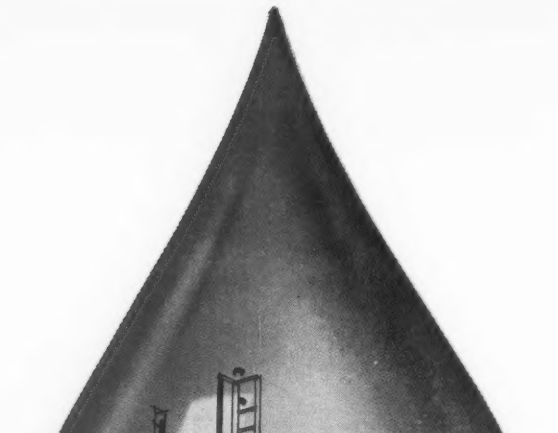
Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

It's Here!

Sinclair

TOLUOL
XYLOL
PARAXYLENE
and
HEAVY AROMATICS



Completion of the Sinclair Aromatics Unit at Marcus Hook, Pa., Refinery means that a *new* and *dependable* source of supply of important petro-chemicals is now available to you. Designed for quantity production of high-purity Toluol, Xylol, ParaXylene and Higher boiling aromatics, this new Sinclair unit is a big step forward in meeting a basic industrial need.

If your manufacturing processes call for reliable supplies of these aromatic hydrocarbons, Sinclair is ready to serve you. For complete information call or write to . . .

SINCLAIR CHEMICALS, INC.

(Subsidary of Sinclair Oil Corporation) 600 Fifth Avenue, New York 20, N. Y., Circle-6-3600

all branched chain paraffinic hydrocarbons). Characteristics discussed are:

1. volatility or evaporation rate
2. solvent power
3. Kauri Butanol number
4. aniline point
5. butyl acetate dilution ratio
6. flash point
7. odor

PVP, 45, #3, 3/55, p. 25

22.2.3. Waters continues his series on paint thinners from petroleum. This second part includes normal and iso-parafins. PIM, 70, #2, 2/55, p. 20

22.2.4. Waters continues his series on paint thinners from petroleum. This seventh part discusses odorless paint thinners from petroleum. PIM, 70, #7, 7/55, p. 17

cf:
22.1.1
22.1.15
26.2.2

Manufacturers:

American Mineral Spirits Company
Anderson-Prichard Oil Company
The Atlantic Refining Company
The R. J. Brown Company
Central Solvents & Chemicals Company
The C. P. Chemical Solvents, Inc.
Esso Standard Oil Company
Gulf Oil Corporation
Pennsylvania Refining Company
Phillips Petroleum Company
Sinclair Chemicals, Inc.
Shell Oil Company
Skelly Oil Company
Standard Oil Company of Ohio

22.3.1. Waters continues his series on paint thinners from petroleum. This fourth part includes aromatics and alkyl aromatics. PIM, 70, #4, 4/55, p. 14

cf:
22.1.15
22.2.2

Manufacturers:

American Cyanamid Company
American Mineral Spirits Company
Anderson-Prichard Oil Corporation
Barrett Division
The R. J. Brown Company
Central Solvents & Chemicals Company
The C. P. Chemical Solvents, Inc.
Cosden Petroleum Corporation
Eastern States Chemical Corporation
Esso Standard Oil Company
Koppers Company, Inc.
Neville Chemical Company
Oronite Chemical Company
Pan American Chemicals
Pennsylvania Industrial Chemical Corp.
Shell Oil Company
Skelly Oil Company
Socony Mobiloil Company
Standard Oil Company of Ohio
Sun Oil Company
Velsicol Corporation

22.4.1. Better methanol synthesis is the subject of a Chemical Engineering pictured flowsheet. CE, 62, #6, 6/55, p. 370

22.4.2. Kobe, et al, determined critical properties and vapor pressures of some ketones. An apparatus was constructed permitting the determination of the critical properties with one charge of organic compound. The variable volume, by the removal of mercury, permits the determination of the vapor pressure curve and an isometric in the single-phase regions. From the intersection of these isometrics with the vapor pressure curve the critical point can be determined. In this manner the critical point was determined for six ketones and n-heptane.

Correlations and equations are given for the critical temperatures and pressures of ketones. IEC, 47, #9, 9/55, p. 1767

22.4.3. Rudd reviews the past, present and possible future of

DRAWING SAMPLE FROM TANK CAR. Samples are drawn from top, middle and bottom of car, and each tested independently. For each shipment, Sun keeps a record of the purity analysis—available for your reference, if desired.

High-Purity Sun Aromatics
Aid Paint and Varnish Uniformity

Toluene and Xylene tested in process and even after loading into tank cars

Fourteen times during and after the refining process, samples of Sun aromatics are brought to the laboratory to be tested for purity. These tests are the best practical assurance that the aromatics you receive are absolutely pure.

These aromatics are made in a new $15 million Sun Oil Company refinery devoted exclusively to this use. Modern refining methods combine with rigid quality controls to maintain consistently high purity. This means you can more easily turn out end-products of constant uniformity and high quality—month in and month out. For detailed specifications and analysis data on Toluene or Xylene, write Dept. PVA

DISTILLATION RANGE TEST. Each sample is tested under precise control and with extremely accurate measuring facilities. Samples must fall within the narrow boiling ranges specified in order to pass the test.

PARAFFIN TEST. Sun Toluene is guaranteed to contain less than 0.5% paraffins—substantially below the ASTM maximum of 1.5%. Samples normally contain no measurable paraffin whatever.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY
SUNOCO
PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL
Refiners of famous High-Test Blue Sunoco Gasoline

ketone solvents for nitrocellulose lacquers. Includes replacement of esters by ketones, evaporation rates, dilution ratio, viscosity, blushing, and flow properties. PM, 25, #9, 9/55, p. 335

22.4.4. The Bordon Company issued bulletin M-19 describing methyl acetone, an ideal solvent for paint removers and lacquer thinners.

22.4.5. The Carbide & Carbon Chemicals Company issued:

4-page F-4811A describing Carbitol acetate

8-page F-5897A describing Isopherone

4-page F-8109A describing n-Butyl Benzoate

8-page F-8307 describing Glycol Carbonates

2-page F-8517B describing Primary Amyl Alcohols

4-page F-8636 describing Butyl Carbitol

4-page F-8637 describing Methyl Isobutyl Ketone

4-page F-8644 describing Butyl Carbitol Acetate

4-page F-8911A describing Primary Amyl Acetates

12-page F-8650 describing Acetone

12-page F-8140A describing Ethyl Acetate

62-page F-4763C describing Glycols

16-page F-8731 describing Isopropanol

16-page F-8141A describing Methanol

16-page F-8738 describing Propylene Glycol

22.4.6. The Quaker Oats Company issued 16-page bulletin 203-A listing physical data on QO Furfurol.

22.4.7. The Shell Chemical Corporation issued Bulletin SC:55-18R describing Neosol, Shell's proprietary ethyl alcohol.

cf:
22.1.1
22.1.14
Manufacturers:
American Monomer Corporation
Baird Chemical Corporation
The Borden Company
Carbide & Carbon Chemicals Company
Celanese Corp. of America
The C. P. Chemical Solvents, Inc.
The Colton Chemical Company
Commercial Solvents Corporation
The Dow Chemical Company
Eastman Chemical Products, Inc.
Enjay Company, Inc.
General Aniline & Film Corporation
Monsanto Chemical Company
Olin Mathieson Chemical Corporation
Publicker Industries, Inc.
The Quaker Oats Company
Sharples Chemicals, Inc.
Shell Chemical Company
Wyandotte Chemicals Corporation

22.5.1. The Diamond Alkali Company issued 14-page bulletin describing Diamond Chlorinated Solvents.

cf:
22.1.14
Manufacturers:
The C. P. Chemical Solvents, Inc.
The Diamond Alkali Company
The Dow Chemical Company
E. I. Dupont de Nemours & Co., Inc.
Kolker Chemical Works, Inc.
John B. Moore Corporation
Solvay Process Division

22.6.1. McCullough, et al, determined several of the thermodynamic properties of nitromethane. These included the vapor pressure at 15 temperatures (55 to 136°), the heat of vaporization at 4 temperatures (318 to 374°K), and the vapor heat capacity at 2 to 4 pressure at each of 6 temperatures (363 to 523°K). These data were used to compute the chemical thermodynamic properties of nitromethane from 0 to 1500°K. JACS, 76, #19, 10/4/54, p. 4791

cf:
22.1.14
Manufacturers:
Carbide & Carbon Chemicals Company
Commercial Solvents Corporation

22.7.1. Thomas & Hawkins measured the densities, dielectric constants and refractive indexes at 25° for the following terpenes: α-pinene, β-Pinene, terpinolene, α-terpinene, γ-terpinene, d-limonene, 1-limonene, myrcene and alloocimene, dipentene, pinane, and Δ^3-carene. A thoroughly tested heterdyne beat frequency apparatus was used for the determination of the dielectric constants. JACS, 76, #19, 10/4/54, p. 4856

cf:
1.2.20
15.1.1
38.8.1

Manufacturers:
American Turpentine Farmers Assn.
Arizona Chemical Company
Godfrey L. Cabot, Inc.
Central Solvents & Chemicals Company
Hercules Powder Company
Newport Industries, Inc.

ENJAY

alcohols
esters
ketones

36 years of service and supply
to the surface coating industry

ENJAY COMPANY, INC.
15 West 51st St., New York 19, N. Y.

CHAPTER 23

OILS, FATTY ACIDS, FATTY ALCOHOLS

23.1.1. Petit discusses a study of the polymerization of drying oils, which superficially seems so well known. The author attempts to call attention to the secondary phenomena which takes place along with the classical reaction of pure polymerization. The same considerations are valid in explaining a number of other happenings. Some of the phenomena occurring in the bodying of oils are considered inexplicable since the simple explanation has not yet occurred to anyone. OD, 26, #359, 12/54, p. 1208

23.1.2. Cowan reviews three lines of work related to protective coatings that have been or are being effected at three of the Utilization Research Branches (formerly known as Regional Research Laboratories) of the U. S. Dept. of Agriculture. These three include the epoxidation of fats and oils (work done at Eastern Branch), acetoglycerides (done at Southern Branch), and the composition of linseed glycerides (done at Northern Branch). OD, 26, #359, 12/54, p. 1211

23.1.3. Petit studied the polymerization of drying oils aimed toward a better understanding of the structive of bodied oils. This paper calls attention to the secondary phenomena which take place along with the classical reaction of pure polymerization. APJ, 39, #12, 12/6/54, p. 32

23.1.4. Cowan reviews three lines of work related to protective coatings that have been or are being done at three of the Utilization Research Branches(formerly known as Regional Research Laboratories) of the U. S. Dept. of Agriculture. Epoxidation of fats and oils, acetoglycerides, and the composition of linseed glycerides are discussed. APJ, 39, #13, 12/13/54, p. 100

23.1.5. Drying oil technology is discussed in a series of article by the Editorial Staff of Paint and Varnish Production. This first part deals with the sources of oils and methods of isolation. PVP, 45, #1, 1/55, p. 28

23.1.6. Drying oil technology is discussed in a series of articles by the Editorial Staff of Paint and Varnish Production. This second part deals with refinery operations. Unit operations, oil refining, and treated oils are reviewed. PVP, 45, #2, 2/55, p. 30

23.1.7. Petit studied the structure of bodied oils. It may seem strange to devote time to the study of the polymerization of drying oils, which superficially seems so well known. The Diels-Alder reaction, secondary reactions, and the effect of boron trifluoride are discussed. Some of the phenomena occurring in the bodying of oils are considered inexplicable since the simple explanation has not yet occurred to anyone. PVP, 45, #2, 2/55, p. 37

23.1.8. Drying oil technology is discussed in a series of articles by the Editorial Staff of Paint and Varnish Production. This third part deals with methods of modifying oils and includes fractionation of fatty acids, distillation of oils-high vacuum, solvent extractions, removal of antioxidants, catalyzed modifications, and ester interchange. PVP, 45, #3, 3/55, p. 34

23.1.9. The discovery of kamala seed oil is an important step in solving India's drying oil problem. So far the main difficulty in its use has been the high cost involved in its extraction. Puntambekar indicates a method by which the cost may be brought within the practical scheme of things. PI, 4, #1, 4/54, p. 85

23.1.10. Ajmani discusses bhilawan nut shell oil. Electrical properties as well as its use in black stoving enamels are discussed. The composition of this oil is absolutely uncertain, hence main work on this liquid has been of an empirical nature only. PI, 4, #1, 4/54, p. 90

23.1.11. Methods for determining the acid, hydroxyl and iodine values of cashew nut shell liquid are described by Kale & Kamath. Based on the determination of these constants, the composition of cashew nut shell liquid can be calculated and its performance predicted. PI, 4, #3, 6/54, p. 27

23.1.12. Bhale & Bafna discuss bhilawan shell liquid. Resins suitable for use in making brakelinings or clutch facings have been obtained by heating a mixture of BSL distillate, furfural and dialkylsulphonates. PI, 4, #3, 6/54, p. 35

23.1.13. Cornell discusses new drying oils for caulking compounds. Marine oils, soya oils, and other highly saturated marine oils are widely used in this connection. POCR, 117, #24, 12/2/54, p. 36

23.1.14. Rich describes a pilot plant constructed in order to develop new adsorbent clays for bleaching fatty oils, solve bleaching problems encountered in the fatty oil industry, and develop improved bleaching methods.

The pilot plant includes units for neutralizing, bleaching, hydrogenating, and deodorizing, which are miniature counterparts of the commercial units. Design, construction, and operation of the units are described.

Examples of problems studied in the pilot plant are given. The examples illustrate the type of work carried out, and they present data that confirm the high adsorptive capacity of a newly developed bleaching adsorbent, indicate the causes of color reversion and demonstrate the effect of simultaneous addition of water and bleaching adsorbent to the bleach tank. IEC, 46, #11, 11/54, p. 2272

23.1.15. Part IV of the review on drying oil technology covers chemical processing. It includes:

1. esterification of fatty acids with higher alcohols.
2. varnish cooking
3. polyesterification
4. removal of hydroxy and keto groups
5. isomerization
6. dimerization and polymerization
7. halogenation and dehydrogenation
8. oxidative degradations
9. epoxidation
10. maleinization and Diels-aldes condensations
11. copolymerization

PVP, 45, #5, 4/55, p. 34

23.1.16. Part V concludes the series on drying oil technology prepared by the editorial staff of Paint and Varnish Production. Drying mechanisms are discussed, including the hydroperoxide theory, isomerization during oxidation, and high temperature oxidations. PVP, 45, #6, 5/55, p. 27

23.1.17. Kreig reviews economic trends and problems in fats and oils. Economic-research relationships, basic economic characteristics, economic developments, outlook, and industry problems are included. JAOCS, 31, #11, 11/54, p. 489

23.1.18. Wheeler reviews the raw materials for and recovery of inedible vegetable oils, fats and fatty acids. JAOCS, 31, #11, 11/54, p. 494

23.1.19. Formo discusses ester reactions of fatty materials. Esterification reactions, esters of higher monohydric alcohols, other monohydric esters, esters of polyhudric alcohols, esterification with glycerol, non-glycerol polyhydric alcohol esters, alcoholysis, alcoholysis by monohydric alcohols, alcoholysis by polyhydric alcohols, acidolysis, interesterification, and directed interesterification are included. JAOCS, 31, #11, 11/54, p. 548

23.1.20. Wilhelmy & Barr discuss research as the key to future markets for drying oils. JAOCS, 32, #4, 4/55, p. 204

23.1.21. Fitzgerald reviews unsolved problems in the utilization of drying oils in protective coatings. JAOCS, 32, #4, 4/55, p. 210

23.1.22. Mundy presents a preliminary report on a program of research carried out over the past few years on the reaction between unsaturated hydrocarbons and drying oils. The general drying oil picture, hydrogen-drying oil reactions, plant design, the adduct as film former, and applications are discussed. JOCCA, 38, #5, 5/55, p. 219

23.1.23. Sims & Cooper discuss some aspects of the fluorescence of drying oils. The fluorescence may arise from both the non-glyceride and the glyceride components of the oil. When linseed and safflower oils are heated, fluorescence decreases at first and then increases as polymerization increases. The fluorescence of heated vegetable oils is masked by decomposition products and by nitromethane. Relating fluorescence to other characteristics of heated oils shows different functional relations for linseed, safflower, tung, and oiticica oils, and a general similarity of behavior between the two non-conjugated oils and also

Quality assured by the SPENCER KELLOGG Trade Mark
KELLOGG'S THE TEST TELLS 1894
The First Name in Vegetable Oils
The most COMPLETE SERVICE in Refined Vegetable Oils
SPENCER KELLOGG AND SONS, INC.
BUFFALO 5, N. Y.

Linseed Varnish Oils	Linseed (Modified) Oils	Soybean (Modified) Oils
Linseed Grinding Oils	...Kellin...Esskol	...Drisoy...Cykelsoy
Linseed Boiled Oils	...Kel-X-L...Cykelin	...Cykel 70...Kelsoy 40
Linseed Oxidized Oils	...Cykelin 70...Keltrol L	...Keltrol 60
Linseed Polymerized Oils	Soybean Varnish Oils	"Synthenol" (Dehydrated
Solinox and Soy Solinox	Soybean Oxidized Oils	Castor Oils)

Styrenated Linseed and Soybean Oils

between the conjugated oils. JAOCS, 32, #7, 7/55, p. 381

23.1.24. Youngs & Sallans studied the use of acetone as a selective solvent for vegetable oils. It has been shown that useful fractionations of soybean and linseed oils can be made, using a selective solvent consisting of 3 to 7 parts of water per 100 parts of acetone. Equilibrium diagrams were determined and their use is illustrated by application to a hypothetical separation. JAOCS, 32, #7, 7/55, p. 397

23.1.25. To clarify some of the discrepancies reported in the study of the manufacture and drying of styrenated products, Slansky has undertaken the series of laboratory and plant experiments, reported here. He also summarizes the conclusions of previous workers, indicates the value of these products to the paint industry and records the results of exposure tests and a study of their dielectric properties. PM, 25, #2, 2/55, p. 54

23.1.26. Howard & Brace discuss the methods used for the production and refining of drying oils for use in the paint and allied industries. PM, 25, #5, 5/55, p. 177

23.1.27. Greaves reviews recent advances in drying oils. The utilization of various chemicals such as styrene, cyclopentadiene and other unsaturated hydrocarbons and other aspects of drying oil research are considered. It is suggested that these compounds together with radiation chemistry may perhaps give rise to the most important and interesting developments in the immediate future. PM, 25, #5, 5/55, p. 183

23.1.28. Mills reviews drying oils, including substitute drying oils, drying-oil copolymers, fatty acids in resin manufacture, and analyses of oils. PT, 18, #206, 11/54, p. 87

23.1.29. In the method of treating crude glyceride oils and fats to remove the non-oil impurities by the hydration of said impurities the steps which comprise treating the crude oil or fat obtained chiefly from the extractor and which has not been subjected to any substantial centrifuging or refining operation by injecting dry steam into the oil or fat at relatively small proportions and at a relatively low temperature to precipitate the hydrated non-oil constituents, and separating the hydrated non-oil constituents from the oil. USP 2,686,193

23.1.30. A process which comprises copolymerizing, by the action of heat, a styrene compound selected from the group consisting of styrene, alphamethyl styrene and their polymerisable nuclear chlorine, methyl and ethyl substitution derivatives with a vegetable drying oil in the presence of a transfer agent selected from the group consisting of carbon tetrachloride, ethylene dichloride and tetrabromethylene. USP 2,698,839

23.1.31. A process of recovering oils, fats and waxes from earthy absorbent materials used in refining said oils, fats and waxes which consists in heating said earthy absorbent material with an aqueous solution of sodium hydroxide in an amount sufficient to neutralize the earthy absorbent and in the presence of a detergent, in which the calculated quantity of sodium hydroxide required to react completely with the earthy absorbent material is added to a mixture of said earthy absorbent material and water in amount equal to 2 to 4 times the weight of said earthy absorbent material at 60°C., agitating, and, after disintegration of the earthy absorbent material, a further quantity of sodium hydroxide sufficient to produce the necessary soap to cause separation of the oil is added while the temperature is raised to 100°C., and removing said oils, fats and waxes from the mixture. USP 2,706,201

cf:
1.2.20
2.2.1
18.2.1
23.10.1
24.10.2
26.4.7
32.2.5
32.2.6
32.2.8
32.3.1
32.3.2
32.3.3
38.1.4
38.8.4

Manufacturers:
Crownoil Chemical Co., Inc.

23.2.1. Sleightholme & Seawell studied some products of the heat-thickening of linseed oil.

The passage of inert gas over the surface of linseed oil during heat thickening increases the amount of material distilling over but does not affect its nature nor influence the course of the reaction. The passage of air over the surface, on the other hand, causes some decomposition, with the formation of water, lower fatty acids and aldehydes; the amount of distillate is increased.

Ultra-violet spectroscopic examination of the free acids present in the stand oil and of the acids produced by saponifying stand oil gives little information about the composition. Low temperature crystallization seems to offer better prospects of success in this field. The free acidity in a linseed oil is not due entirely to the presence of monomeric fatty acids of the linseed oil type: complex acidic glycerides are present which may be of very high molecular weight. The presence of such compounds probably accounts for the livering with zinc oxide of certain highly polymerized oils of comparatively low acid value. JOCCA, 38, #4, 4/55, p. 178

cf:
23.1.2
23.1.4
23.1.23
23.1.24
24.2.2
24.2.3
27.3.2
27.12.1
32.2.6

Manufacturers:
Archer-Daniels-Midland Company
Brown-Allen Chemicals, Inc.
Cargill, Inc.
National Lead Company
Pacific Vegetable Oil Corporation
Spencer Kellogg & Sons, Inc.

23.3.1. A symposium on castor oil presented in Paintindia includes the following papers:

Fatty Acid Composition of Castor Oil—J. G. Kane & B. Sreenivasan

Dehydrated Castor Oil—N. N. Narayanan & S. K. K. Jatkar

D. C. O. and its After-tack—M. A. Sivasamhan, S. A. Saletore, S. H. Zaheer

10-Undecenoic Acid and Heptaldehyde From Castor Oil—A. S. Gupta & J. S. Aggarwal

Heat Treatment of Castor Oil—T. V. Subba Rao

PI, 4, #1, 4/54, p. 127

23.3.2. Gupta & Aggarwal discuss the hydrogenation of castor oil. This is one of the papers read

at the symposium on castor oil referred to in 23.3.1. PI, 4, #2, 5/54, p. 27

23.3.3. McCormack & Bolley have fractionated castor oil methyl esters by continuous countercurrent liquid-liquid extraction at 3°C and at 6°C with methanol-heptane and heptane-methanol as solvents, using an extraction column containing four equilibrium stages. The methyl ricinoleate fraction produced compared favorably with pure methyl ricinoleate with respect to hydroxyl value and optical activity.

A solubility diagram has been constructed for methanol-castor oil methyl esters-heptane at 8.4°C and 24°C.

A selectivity diagram has been prepared for methanol-castor oil methyl esters-heptane at 8.4°C and 24°C. JAOCS, 31, #10, 10/54, p. 408

23.3.4. Sivasamban, et al, discuss some studies on dehydrated castor oil. Includes introduction, production and markets, work in the Central Laboratories, Hyderabad, specifications and characteristics of D. C. O., D. C. O. manufacture: costing, and sale and profit possibilities. PI, 5, #2, 5/55, p. 25

23.3.5. A process of dehydrating castor oil comprising continuously passing castor oil and a dehydration catalyst into a vessel in which the mixture is vigorously agitated and maintained at a temperature of 260° to 375°C., the treated oil being withdrawn from the vessel at such a rate as to maintain a substantially constant volume of liquid in the vessel, the ratio of the said volume to the volume of castor oil added per minute being from 0.5:1 to 10.0:1. USP 2,711,416

23.3.6. The Baker Castor Oil Company issued 16-page catalog and product guide of castor oils and chemical derivatives.

cf:
23.11.10
26.4.9
Manufacturers:
The Baker Castor Oil Company
Spencer Kellogg & Sons, Inc.

23.4.1. Holmes, et al, reviews the characteristics of domestic tung oils. Domestic tung oil is a very uniform product as shown by the determination of the chemical and physical properties of 74 samples taken over three successive milling seasons.

The refractive index, refractive dispersion, and heat test are correlated with the total eleostearic acid content, the correlation coefficients being 0.69, 0.73, and -0.62 respectively, which indicates that any one of these values can be taken as a rough measure of the eleostearic acid content. The correlation of the eleostearic acid content with the Wijs and hydrogen iodine values has lower, 0.48 and 0.53, respectively. A correlation of -0.81 was found between refractive index and heat test. JAOCS, 31, #10, 10/54, p. 417

cf:
32.2.1
32.2.6

Manufacturers:
Brown-Allen Chemicals, Inc.
Pacific Vegetable Oil Corporation

23.5.1. Simmons & Quackenbush studied the comparative rates of formation of fatty acids in the soybean seed during its development.

Lincoln soybeans harvested at successive stages of maturity showed continuous increases in amounts present of each of the fatty acids: saturated, oleic, linoleic, and linolenic.

The iodine value and linolenic acid percentages of the oil decreased somewhat during the early stages of seed development. The linoleic acid and total oil percentage in the bean increased continuously until the 50th day then remained constant. Oleic and saturated acids fluctuated.

No evidence for dehydrogenation of saturated fatty acids was obtained either in the oil analysis or in tests of soybean tissues for dehydrogenase activity. JAOCS, 31, #12, 12/54, p. 601

23.5.2. Beal & Lancaster studied the effect of agitation on selectivity in the hydrogenation of soybean oil. A total of 12 hydrogenations were conducted in the pilot plant. Judging from its effects on the course of hydrogenation, agitation cannot simply be defined in terms of speed. JAOCS, 31, #12, 12/54, p. 619

23.5.3. MacMillan & Melvin studied color characteristics and chemical analyses of oil from frost —and weather-damaged soybeans. JAOCS, 32, #2, 2/55, p. 85

23.5.4. Kalbag, et al, report some polarographic studies of fat oxidation. The polarograms of autoxidized soybean oil indicated the presence of a peroxide, which was formed in considerably larger proportion in soybean oil than in methyl esters of similar composition. JAOCS, 32, #5, 5/55, p. 271

cf:
23.1.13
23.1.24
26.4.6

Manufacturers:
Archer-Daniels-Midland Company
Brown-Allen Chemicals, Inc.
Cargill, Inc.
Pacific Vegetable Oil Corporation
Spencer Kellogg & Sons, Inc.

23.6. (No abstracts)

cf:
32.2.6
Manufacturers:
Brazil Oiticica, Inc.
Brazilian Industrial Oils
Pacific Vegetable Oil Corporation

23.7. (No abstracts)

cf:
23.1.13
Manufacturers:
Archer-Daniels-Midland Company
Cargill, Inc.
Pacific Vegetable Oil Corporation

23.8.1. Mann reviews six years of progress in tall oil. Tall oil itself is not strictly a drying oil. Returns of a survey made, and reported on in this paper, indicate a tremendous amount of interest both in tall oil and the survey, and that the amount of tall oil being actually consumed by the paint, varnish and resin industry is evidently much greater than that reported by the Bureau of the Census. In spite of improvements needed in odor, color and dry of the tall oil, in 1953 its use in paint and varnish manufacture was exceeded only by linseed, soybean and tung oils. APJ, 39, #3, 10/4/54, p. 36

23.8.2. Brushwell presents part III of "Tall oil—Its Functions In The Paint Industry." Under "Chemistry of Tall Oil in relation to its uses", the following are discussed: saponification, esterification, decarboxylation, sulfonation, sulfurization, polymerization, reaction with unsaturated monomers, and miscellaneous. Under "Use of Tall Oil Soaps" metallic driers are discussed. The article also includes limed tall oil, rosin ester varnishes based on tall oil,

and styrenation of tall oil. APJ, 39, #6, 10/25/54, p. 80

23.8.3. Brushwell presents part IV of "Tall Oil—Its Functions In The Paint Industry." He discusses core oils, tall oil esters, maleated tall oil esters, protective coatings formulations based on tall oil esters, and tall oil in alkyd resins.

A summary covering the entire series of four parts is presented. APJ, 39, #9, 11/15/54, p. 70

23.8.4. Singer presents Part II of Chapter XIII of his "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter discusses "Other Exterior Finishes." APJ, 39, #11, 11/29/54, p. 62

23.8.5. Herrlinger reviews tall oil. Tall oil processing is a relatively new and rapidly growing industry. Tall oil refining techniques have advanced to the point where fatty acids substantially free from rosin acids and rosin substantially free from fatty acids are produced. JAOCS, 31, #11, 11/54, p. 508

23.8.6. Part I of a staff report on tall oil includes:

1. Introduction
2. Tall Oil Defined
3. Production and Economics
4. Producers and Refiners

POCR, 118, #15, 7/28/55, p. 10

23.8.7. The second part of the review of tall oil discusses tall oil refining. POCR, 118, #16, 8/11/55, p. 20

23.8.8. Part III of the staff report on tall oil covers its use in protective coatings and presents a summary of the 3-part series. POCR, 118, #17, 8/25/55, p. 22

23.8.9. A resin composition comprising a vinyl chloride resin and a fraction of the esters of tall oil with a monohydric phenol, the said fraction being substantially free of material distilling up to 220°C. at 2 mm. of mercury pressure, containing all of the tall oil and monohydric phenol esters boiling above 220°C. at 2 mm., and serving as plasticizer for the vinyl chloride resin and giving a composition characterized by freedom from exudation of plasticizer on standing. USP 2,695,897

23.8.10. The Tall Oil Association issued bulletins #13, 14, 15, on Tall Oil for Resins—parts I, II, & III.

cf:
15.1.1
23.11.1
Manufacturers:
Arizona Chemical Company
Newport Industries, Inc.
K. A. Steel Chemicals, Inc.
Union Bag & Paper Corporation
West Virginia Pulp & Paper Company

23.9. (No abstracts)

cf:
1.2.17
23.1.23
23.1.28
32.2.6
Manufacturers:
National Lead Company
Pacific Vegetable Oil Corporation

23.10.1. Terrill discusses unsolved problems in the modification of drying oils. JAOCS, 32, #4, 4/55, p. 208

cf:
23.1.28
Manufacturers:
Enjay Company, Inc.
McCloskey Varnish Company
Pan American Chemicals
Reichhold Chemicals, Inc.
Fred'k A Stresen-Reuter, Inc.

23.11.1. Pattison reviews trends in tall oil fatty acids. APJ, 39, #21, 2/7/55, p. 24

23.11.2. Ault, reviews the history and technological trends in inedible fats and fatty acids. JAOCS, 31, #11, 11/54, p. 486

23.11.3. Sutker reviews the handling of fats and fatty acids. JAOCS, 31, #11, 11/54, p. 513

23.11.4. Muckerheide discusses separation methods for the production of fatty acids. The panning and pressing method, fractional distillation, and solvent crystallization are discussed. Other methods are mentioned. JAOCS, 31, #11, 11/54, p. 544

23.11.5. Earhart discusses the applications of fatty acids and derivatives in alkyds and other polyester coating resins. Fatty acids are used principally in alkyd resins, epoxy resin esters, in-situ varnishes, maleinized oils, and polyhydric alcohol esters. JAOCS, 31, #11, 11/54, p. 597

23.11.6. A method has been devised, by Howton, et al, by which linoleic acid isolated from natural sources may be used as a starting material for the preparation of the substance labeled with isotopic carbon in the carbonyl group. JACS, 76, #19, 10/4/54, p. 4970

23.11.7. Inouye, et al, describe a method by which unsaturated fatty acid esters can be separated and identified by reversed-phase paper chromatography. The procedure is based upon the formation of the mercuric acetate addition compounds of the esters and the detection of the compounds on the chromatograms, using the sensitive color reaction with diphenylcarbazone. JAOCS, 32, #3, 3/55, p. 132

23.11.8. Kolb & Brown studied low temperature solubilities of fatty acids in selected organic solvents. The acids studied were palmitic, stearic, oleic, elaidic, petroselinic, petroselaidic, linoleic, stearolic, arachidic, eicosenoic, behenic, erucic, and brassidic. The solvents used were methanol, ethyl acetate, diethyl ether, acetone, toluene, and n-heptane. Temperature range studied was from 10° to -70°. JAOCS, 32, #5, 5/55, p. 357

23.11.9. In part I of a staff report on fatty acids for the alkyd industry, the following topics are covered:

A. Introduction
B. Fatty Acid Specifications
   1. Meaning of Specifications
   2. Meaning of Fatty Acid Composition.

POCR, 118, #13, 6/30/55, p. 18

23.11.10. Rowe discusses distilled dehydrated castor oil fatty acids. Early work and Schreiber's patents are reviewed. He then discusses the dehydration of ricinoleic acid, avoiding the formation of ricinoleic acid, the degree of conjugation, the case for total iodine value, composition and behavior of DCO fatty acids, drying without yellowing, alkyd and epoxy resins, urethanes, amides, and vinyls. PT, 19, #210, 3/55, p. 79

23.11.11. The second part of the review of fatty acids for the alkyd industry includes:

1. Analytical Methods
2. Determination of Fatty Acid Composition
3. Typical Alkyd Formulations
4. Handling of Fatty Acids.

POCR, 118, #14, 7/14/55, p. 19

23.11.12. Rowe reviews the latest word on the newest fatty acids. These fatty acids—distilled dehydrated castor oil fatty acids—are finding increased use in resin and

varnish industry. CPVM, 29, #9, 9/55, p. 24

23.11.13. Wilson & Company issued slide-chart: "A Guide to Better Fatty Acids".

cf:
18.1.2
23.1.18
23.1.19
23.1.28
23.5.1
24.4.3
24.5.1
24.10.2
32.1.3
38.7.4

Manufacturers:
Archer-Daniels-Midland Company
Arizona Chemical Company
Armour Chemical Division
The Baker Castor Oil Company
El Dorado Oil Works
Emery Industries, Inc.
General Mills, Inc.
A. Gross & Company
Pacific Vegetable Oil Corporation
Spencer Kellogg & Sons, Inc.
Swift & Company
Wilson & Company

23.12.1. The two commercially important processes for the production of fatty alcohols are reviewed, by Wilson, with respect to operations, types of alcohols obtainable, relative economics, properties and uses of the fatty alcohols.

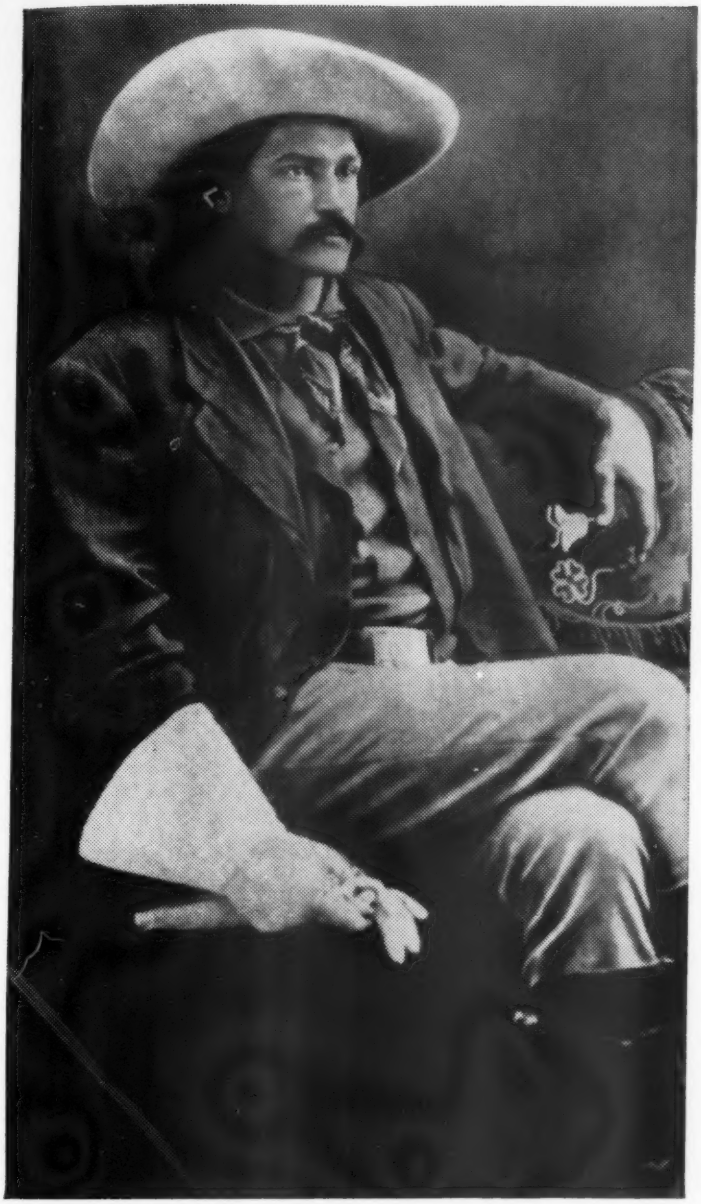
The sodium-reduction process is applicable to the reduction of saturated as well as unsaturated esters. Hydrogenolysis produces predominantly saturated alcohols.

Hydrogenolysis has the advantages of cheaper raw materials, wider choice of feed stocks, and wider choice of locations, whereas sodium reduction is more flexible, requires a lower initial investment, involves simpler operation and maintenance, and yields products of superior quality for detergent uses.

The physical and chemical properties of fatty alcohols are reviewed briefly. JAOCS, 31, #11, 11/54, p. 564

cf:
1.2.20
23.1.19

Manufacturers:
Archer-Daniels-Midland Company
E. I. Dupont de Nemours & Co., Inc.
Ethyl Corporation
The Stephan Chemical Company



His calling card had claws on it

LUTHER KELLY lied about his age and got into the army at 15. They sent him West in 1865, and he stayed.

He liked the wilderness. Game abounded. In Trappers' Lake, "trout were so thick they obscured the bottom."

Hostile Indians were also pretty thick. But when two tried ambushing him, he killed both with his Henry .44.

He learned Sioux and sign language.

One day, he visited General Miles, sending a huge fierce-clawed bear's paw to Miles as his calling card. Miles made him chief scout against the Sioux.

But by 1885, the country was taming down, and Yellowstone Kelly left it.

Two decades later, Teddy Roosevelt praised the heroic treasurer of Surigao in the Philippines who saved the town from outlaws. Name: Luther S. Kelly.

Yellowstone Kelly's body now rests at Kelly Mountain in Montana. But his restless, pioneering spirit lives on in the heart of today's America. For it is the trail-blazing courage of 165 million people that makes America great, and that provides the real strength behind one of the world's finest investments: our country's Savings Bonds.

Why not guard your security with this strength? Invest in U.S. Series E Savings Bonds. And hold on to them!

It's actually easy to save money—when you buy Series E Savings Bonds through the automatic Payroll Savings Plan where you work! You just sign an application at your pay office; after that your saving is done *for* you. The Bonds you receive will pay you interest at the rate of 3% per year, compounded semiannually, when held to maturity. And *after* maturity they go on earning 10 years *more*. Join the Plan today. Or invest in Savings Bonds regularly where you bank.

Safe as America – U.S. Savings Bonds

The U.S. Government does not pay for this advertisement. It is donated by this publication in cooperation with the Advertising Council and the Magazine Publishers of America.

BUTROL®

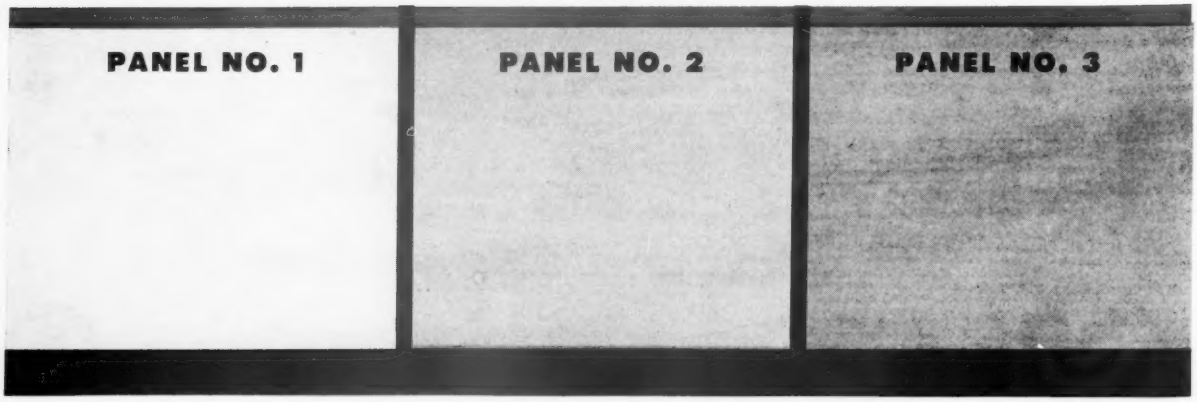
Tested-Proved-Recommended for
1 Can Preservation 2 Film Preservation

On test fences—in paint factories, Butrol has been proved the most effective agent known for the complete preservation of paints. It is widely used and recommended by leading manufacturers of polymers. Butrol is a liquid, ready to use, and is compatable in most formulations. A Buckman technical service representative will be glad to assist you.

BUCKMAN
Laboratories, Inc.
Manufacturing Chemists • Memphis 8, Tennessee
Representatives in Most Countries

INDUSTRIAL MICROORGANISM CONTROL SPECIALISTS

PVA paint on white pine, exposed 18 months to the north on the Bulab paint test fences, Memphis, Tenn. Panel #1 has 1 percent of Butrol in both topcoat and undercoat.
Panel #2 has 1 percent of Butrol in topcoat only.
Panel #3 (control) has no treatment in topcoat or undercoat.



CHAPTER 24

MISCELLANEOUS RAW MATERIALS

24.1.1. Maxcy & Hardiman discuss the use of glyceryl monoleate in alkyd base paints. It has been shown to be effective in modifying the properties of solutions of alkyd resins in odorless thinner. The addition of this ester reduces the viscosities of these solutions. It also extends the limit to which they can be diluted before kick-out of the resin occurs. OD, 27. #361, 2/55, p. 93.

24.1.2. Rinse discusses aluminum alcoholates, a new group of paint additives. Preparation, chemical properties, application in paint vehicles, new drying principle and aluminum alcoholate derivatives are discussed. PVP, 44, #11, 11/54, p. 70

24.1.3. Gates-Reed discusses chemicals in the paint industry. PI, 5, #1, 4/55, p. 57

24.1.4. Maher & Struthers present a discussion designed to familiarize the reader with the unique properties of zein, and to point out how and why this product from corn can contribute desirable properties to a self-polishing floor finish. PVP, 45, #10, 9/55, p. 33

24.1.5. Method of producing an improved water dispersion paint, which includes the step of incorporating in an aqueous paint containing a non-rubbery, resinous, conjugated diene polymer, a water dispersion of a barium salt of an acid naturally occurring in a fat, said barium salt providing at 25°C. at least 0.0003 gram of barium ions per 100 grams of water in the paint, sufficient of said barium salt being incorporated to supply between 0.01 gram and 2 grams of barium ions per 100 grams of polymer present in the paint, without coagulation of the paint, whereby blooming is suppressed on a dried film of the paint exposed to an ambient atmosphere containing a high relative humidity. USP 2,702,284

24.1.6. A 3-p-benzamido-phenyl-coumarin bearing in the benzamido nucleus a group of substituents selected from the following group of combinations: one lower alkoxy radical, two lower alkoxy radicals, three lower alkoxy radicals, one methoxy and one methyl radical, and a methylene dioxy radical attached to two adjacent C-atoms. USP 2,702,296

24.1.7. The Bakelite Corporation issued 2-page Release #8 describing corrosion inhibitors for vinyl latex paints.

cf:
28.1.2

24.2.1. Aggarwal presents an authoritative article on driers in paints and varnishes. Action of driers, efficiency of driers, lead, cobalt, manganese, iron, mechanism of drier action, effect of valency, co-ordinary theories, theory of orientation of glyceride molecules, and other theories of drier action are presented. PI, 4, #1, 4/54, p. 93

24.2.2. Zettlemoyer and Myers studied the use of metal complexes as drying catalysts for oleoresinous vehicles. Cobalt was replaced by manganese and iron in conjunction with a suitable amine additive. In some cases manganese catalysis was improved to the point at which it was superior to cobalt catalysis; in general the greatest improvement occurred with diamines or other difunctional amines possessing resonant structures and by certain and to a greater extent in proportion to its original activity than was manganese.

The finding that catalysis by manganese can be enhanced by relatively inexpensive compounds may constitute an important step in the development of a new drier technology. IEC, 46, #10, 10/54, p. 2220

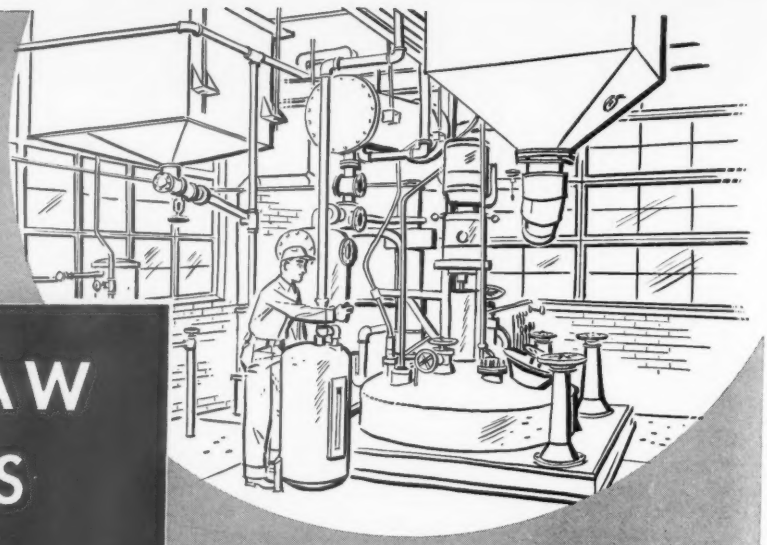
24.2.3. An explanation of the role of the 3rd electronic configuration of the efficacy of the transition metal salts and their complexes as catalysts in the drying of oleoresinous vehicles has been advanced by Myers and Zettlemoyer. The hypothesis has been based on the drying behavior of linseed oil formulations containing conventional metal catalysts and amine additives. IEC, 46, #10, 10/54, p. 2223

24.2.4. Gregg discusses Zirco Drier Catalyst and its use as a paint drier. Based on zirconium, it has properties of interest to the paint formulator. It helps gloss and gloss retention, helps color and color retention, improves adhesion and shock resistance, improves scuff-resistance, prevents loss of dry, and achieves hardness without film embrittlement. OD, 27, #365, 6/55, p. 387

cf:
23.8.2
24.1.2

Manufacturers:
Advance Solvents & Chemical Corporation
Ferro Chemical Corp.
The Harshaw Chemical Company
McCloskey Varnish Company
Naftone, Inc.
Nuodex Products Co., Inc.
Oronite Chemical Company
The Shepherd Chemical Company
Fred'k A. Stresen-Reuter, Inc.
R. T. Vanderbilt Co., Inc.
Witco Chemical Company

24.3.1. Yeager discusses fungus and fungicides. A brief description of bacteria and fungi is followed by a discussion of fungi-



HARSHAW DRIERS

Every Batch is Tested for Uniformity

Harshaw's precise manufacturing specifications demand the following tests for every batch of driers produced:

- **Metal content**
- **Specific gravity**
- **Color**
- **Viscosity**
- **Total solids content**
- **Flash point (T.C.C.)**
- **Moisture content**
- **Acid value**
- **Miscibility with raw linseed oil**
- **Miscibility with mineral spirits**
- **Benzene insoluble content**
- **Customer's specified tests**

Order your next requirement of Driers from Harshaw. Produced and tested at our Plant, Gloucester City, N. J. . . . The most modern facilities available . . . For nationwide distribution through 18 stock points.

TYPICAL HARSHAW DRIERS

LIQUID DRIERS
- Uversol (Naphthenate) Liquids
- Linoresinate Liquids
- Linoleate Liquids
- Lithos
- Octasols
- Pastes
- Pastalls

SOLID DRIERS
- Uversol (Naphthenate) Solids
- Linoresinate Solids
- Linoleate Solids
- Soyate Solids
- Fused Resinates

POWDERED DRIERS
- Precipitates Resinates
- Drying Salts:
  - Cobalt
  - Lead
  - Manganese
  - Zinc

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

cides, how the paint industry is seeking better fungicides, and characteristics of fungicides. The latter include the following:

1. must be low in toxicity
2. " " free from objectionable odors
3. " " effective

OD, 26, #357, 10/54, p. 937

24.3.2. Owen presents a report on the use of copper-8-quinolinolate to produce fungicidal paints. By test it appears to have strong fungicidal properties. CPVM, 28, #9, 9/54, p. 54

24.3.3. Galloway discusses the growth of molds on painted surfaces. Following the introduction, the author discusses factors governing mold growth, the testing of mold-resistance and preservatives. JOCCA, 38, #5, 5/55, p. 250

24.3.4. A test method which evaluates paint fungicides rapidly and provides reliable and reproducible results with small amounts of material has been developed. In this article the reasons for selecting the particular test organism, culture medium and substrate are outlined, together with details of the experiments undertaken. A comparison with tropical exposure tests is also described and the results of trials with 80 compounds indicated. PM, 25, #10, 10/54, p. 345

24.3.5. Sakornbut & Morrill describe a method for the detection of pentachlorophenol in wood by the formation of crystal violet. The minimum "penta" concentration detectable in treated Ponderosa pine sapwood was estimated as 0.022%. AC, 27, #8, 8/55, p. 1259

24.3.6. Hurd & Morrissey describe the preparation and properties of:

di-3-pyridylmercury
bis-(3-pyridylmercuri)-ammonium chloride
6 chloro-3-pyridyl-mercuric chloride.
2-pyridylmercuric chloride

JACS, 77, #17, 9/5/55, p. 4658

24.3.7. 2,6-dinitro-4,5-dichlorophenyl ethers of cellulose. USP 2,697,094

24.3.8. The Monsanto Chemical Company issued a 34-page revision of Bulletin 0-24 listing "Analytical Methods for Pentachlorophenol and Its Salts".

cf:
27.1.9
27.18.1
27.18.2

Manufacturers:
Advance Solvents & Chemical Corp.
Buckman Labs., Inc.
Carolina Aniline & Extract Company
Darworth, Inc.
The Dow Chemical Company
E. I. Dupont de Nemours & Co., Inc.
Ferro Chemical Corp.
Gallowhur Chemical Corp.
The Harshaw Chemical Company
Heyden Chemical Corporation
Innis, Speiden & Co., Inc.
The McGean Chemical Company
Mallinckrodt Chemical Works
Metalsalts Corporation
Monsanto Chemical Company
Mooney Chemicals, Inc.
Naftone, Inc.
Nuodex Products Co., Inc.
The Richfield Oil Corp.
Scientific Oil Compounding Co., Inc.
The Shepherd Chemical Company
Fred'k A. Stresen-Reuter, Inc.
Triangle Chemical Company
Troy Chemical Company
R. T. Vanderbilt Co., Inc.
Witco Chemical Company

24.4.1. Rodriguez & Walsh studied the gelling rates and consistencies of aluminum di-2-ethylhexanoate-liquid hydrocarbon systems. This study was directed toward clarifying the effects of various factors on the gelling rate of aluminum di-2-ethylhexanoate in hydrocarbon solvents. These factors include solvent composition, soap concentration, and temperature. Gel consistency under equilibrium conditions was also studied since it is affected by the same

STEARATES

PLYMOUTH

ALUMINUM STEARATE #222-2A

A *New* SUSPENSION AGENT *that* WILL NOT CHANGE VISCOSITY

This special Aluminum Stearate #222-2A fills an important need by separating the functions of pigment suspension and flow control. It is not sensitive to certain reactive vehicles or high temperatures.

PLYMOUTH ZINC STEARATE SI-35

New FOR SANDING SEALERS

Now Eliminates TIME CONSUMING GRIND

For High Quality Lacquers comparable to the finest ground lacquers. Reduces manufacturing time and costs. Suspension, film clarity, adhesion to wood, cold check, Gardner-Holt stability and sanding characteristics are excellent.

PLYMOUTH ZINC STEARATE XXXH

This lacquer grade stearate provides ease of production with low mill-paste viscosity and no foaming.

PLYMOUTH CALCIUM STEARATE #53

A special grade for paint, varnish and lacquer industry.

PLYMOUTH ALUMINUM STEARATES

#351 "LOW GEL" TYPE • #101 "MEDIUM GEL" TYPE
#801 "HIGH GEL" TYPE

Used for flatting, pigment suspension and viscosity control.

SEND FOR SAMPLES AND DATA

M. W. PARSONS-PLYMOUTH, Inc.

59 BEEKMAN STREET
NEW YORK, N. Y., U.S.A.

Telephone BEEKMAN 3-3162—3163—3164
Cable Address: PARSONOILS, NEW YORK

DISTRIBUTION POINTS AND AGENTS IN ALL PRINCIPAL CENTERS

put odor under your thumb....

with VANDOR odor control materials

The fast growing do-it-yourself market for paints demands increasing attention to consumer appeal factors. Unpleasant paint odor is such a factor—often a big one.

Our experienced odor control engineers will be glad to help you put thumbs down on this negative factor with VANDOR odor control materials.

INDUSTRIAL DIVISION

van Ameringen-Haebler, Inc.

521 WEST 57TH STREET, NEW YORK 19, N. Y.

variables. OD, 27, #361, 2/55, p. 100

24.4.2. Stumpf reviews the properties and applications of metallic pelargonates. The following summary and conclusions are presented:

1. metallic pelargonates are powders ranging in texture from coarse to extremely fine and silky. The lithium, zinc, strontium, calcium, and barium pelargonates are very smooth, fine silky soaps which should be quite applicable to the cosmetics industry.
2. The alkali metal pelargonates are either completely or slightly soluble in water, various alcohols, and ethyl and butyl acetates.
3. Aluminum pelargonate has the unique property of gelling in various organic solvents at room temperature. This property can be readily applied to the paint and printing ink industries.
4. The metallic pelargonates are relatively easy to prepare. The pelargonates are quite stable, have no objectionable odor, can be easily dried in ovens at temperatures of 200-220°F. The finished soaps are uniform, free flowing and of a fine particle size. APJ, 39, #30, 4/11/55, p. 22

24.4.3. Wendt & Wagner discuss the applications of fatty acids in metallic soaps, presenting the pertinent factors concerning the production and applications of solid fatty acid soaps, with particular emphasis on how the fatty acid characteristics come into play. JAOCS, 31, #11, 11/54, p. 590

24.4.4. Chermisinoff takes another look at zinc stearates in protective coatings, and discusses their use in paint, varnishes, and lacquers. APJ, 39, #44, 7/18/55, p. 100

24.4.5. The Witco Chemical Company issued bulletin G-2 describing Witco aluminum actoate. Also Bulletin M-14 describing Witco zinc stearate lacquer grade #3.

cf:
23.8.2
Manufacturers:
Advance Solvents & Chemical Corp.
American Cyanamid Company
The Baker Castor Oil Company
The Harshaw Chemical Company
Mallinckrodt Chemical Works
Metasap Chemical Company
M. W. Parsons-Plymouth, Inc.
The Shepherd Chemical Company
Fred'k A. Stresen-Reuter, Inc.
Synthetic Chemicals, Inc.
Witco Chemical Company

24.5.1. Harwood discusses nitrogen-containing derivatives of the fatty acids, which find use as surface active agents. Amides, nitriles, amines, quaternary ammonium salts, and miscellaneous nitrogen-containing derivatives are reviewed. JAOCS, 31, #11, 11/54, p. 559

24.5.2. Stirton, reviewing fat-based surface-active agents, discusses fat-based surfactants, carboxylic anionic surfactants, fat-based sulfates and sulfonates, sulfonated oils, sulfated fatty alcohols, fat-based sulfates with intermediate linkages, fat-based sulfonates, fat-based sulfonates with an intermediate linkage, fat-based aromatic sulfonates, cationic fat-based surfactants, cationic surfactants with nitrogen joined directly to the hydrophobic chain, cationic surfactants with an intermediate linkage, and nonionic fat-based surfactants.

A review of the fat-based anionic, cationic, and nonionic surface-active agents, primarily those useful in aqueous solution, has shown that the natural fats and fatty acids are particularly suitable raw materials. Because of the presence of the hydrophobic chain and of

LECITHIN HEADQUARTERS OF AMERICA

YELKIN TTS

THE STANDARDIZED LECITHIN

YELKIN TTS improves your product, gives better pigment suspension, immediate wetting and better package stability. Surface active properties promote adsorption at pigment-vehicle interfaces. YELKIN TTS is 100% solids, it saves you money and improves quality.

R&R 551

INTERFACE MODIFIER

R & R 551 solves the problem of pigment dispersion in latex and emulsion paints — promotes rapid dispersion, improves freeze-thaw stability and permits a wider choice of pigments. R & R 551 will help you regardless of the latex or emulsion system you use.

R&R 449

VISCOSITY MODIFIER

R & R 449 a puffing agent of proven permanent effectiveness. Easy to use—requires no premixing.

Consult with our Service Department for full information.

ROSS & ROWE INC.

50 BROADWAY
NEW YORK 4, N. Y.

WRIGLEY BUILDING
CHICAGO 11, ILL.

2 Staley Lecithin Concentrates for oil and water base paints

Sta-Sol—A superior wetting and emulsifying agent for oil base paints, this clear, colorless lecithin concentrate cuts grinding time, improves wetting and pigment dispersion, and reduces the tendency of pigment to settle. Sta-Sol also extends your products' shelf life by preventing hard pack of pigment. Sta-Sol permits increase of pigment to vehicle ratio when needed.

Emultex "A"—Incorporating all the above benefits, but designed for water base paints, Emultex "A" is quickly dispersable in water, and forms a stable solution. It is more fluid than regular fluid lecithin —easy to pour and handle—and accidental spills are easily cleaned. Emultex "A" is clear, light amber—excellent for light or white paints.

When you order Lecithin . . . specify Staley's Sta-Sol or Emultex "A"

For Further Information, write:

A. E. STALEY MFG. CO.
Decatur **Illinois**

PRODUCTS FROM CORN AND SOYBEANS
Staley's

ADDITIVES THAT YOU MAY USE WITH CONFIDENCE IN YOUR FORMULATION

TROYKYD

LEVEL-AID — eliminates brush marks if used in small quantities. In larger percentages it will improve sheen and gloss.

ANTI-MILDEW — phenyl mercury naphthenate

ANTI-MILDEW SPECIAL phenyl mercury oleate contain 10% mercury as metal: The mildewcides that *retain* their efficiency for years because they remain in the film and do not wash or leach out.

ANTI-SKIN — The volatile, low odor, safe, anti-skinning agent. Even too much won't stop your paint from drying.

ANTI-SKIN SPECIAL — slowly volatile: recommended for adding to hot varnishes and for use in dip tanks.

ANTI-FLOAT — a processed calcium carbonate that combines dispersion and surface active features for more universal and permanent effect.

ANTI-SETTLE — a processed clay-maximum non-settling with no impairment in film characteristics.

TROYKYD COMPOUND XYZ — the most powerful anti-settling agent. Will effectively increase viscosity and eliminate sagging, even in alkyds.

ANTI-SAG — the processed oil that stops sagging, improves flexibility, and has minimum effect on gloss, viscosity, etc.

BODYING AGENT 21 BA — will work *more* often on *more* products with *perfect* stability than any other agent in the market. Increases viscosity, improves brushing, prevents settling, lowers R.M.C.

BODYING AGENT GT— very effective in titanium-calcium formulations—prevents sagging and settling, improves viscosity and brushing.

TROY CHEMICAL COMPANY
2589 Frisby Ave. New York 61, N. Y.

How To Turn An ODOR IMP

Into An ANGEL OF GOOD WILL

DEODALL #1, Sindar's new multi-purpose masking agent, replaces objectionable odors in varnishes, lacquers, cleaners, polishes, oils and other products with a fresh, clean scent that promotes sales, good will. Also solves stack odor problems effectively, economically. Ask Sindar for full facts.

SINDAR® *Corporation*
Industrial Aromatics and Chemicals
330 West 42nd Street, New York 36, N. Y.
Branches: Philadelphia • Boston • Cincinnati
Detroit • Chicago • Seattle • Los Angeles • Toronto

a carboxyl group by means of which hydrophilic character can be imparted, a greater variety of surface active agents have been made from the fatty acids than from any other single source. JAOCS, 31, #11, 11/54, p.579

24.5.3. Roe & Brass studied the adsorption of ionic surfactants and their gegenions in the air-water interface of aqueous solutions, by means of surface tension measurements under conditions which permit a simple and exact interpretation. The surface excess in a surfactant solution does not vary with the concentration of surfactant in the bulk solution throughout a wide range just below the so-called critical micelle concentration. Composition of the adsorbed layer and thermodynamic properties of the dissolved surfactant are discussed. Radioactive tracer measurements on solutions of a labeled surfactant have been found to confirm the conclusions reached from surface tension measurements. A new technique for the direct tracer study of adsorption on solid surfaces is described and some results are presented. JACS, 76, #18, 9/20/54, p. 4703

24.5.4. Kortland & Dammers discuss the qualitative and quantitative analysis of mixtures of surface-active agents with special reference to synthetic detergents. An identification scheme for surface-active agents is given which enables these agents or their mixtures to be detected in commercial products. JAOCS, 32, #2, 2/55, p. 58

24.5.5. Rosen has found that surface-active agents containing an active benzenoid nucleus, such as O-substituted alkylphenols and monosulfonated diphenyls, may be detected by the dark red color which they produce when treated with concentrated sulfuric acid and formaldehyde. Other functional groups present in surfactants produce no interfering colors. AC, 27, #1, 1/55, p. 111

24.5.6. Some of the special features of the adsorption of surface-active agents at solid-liquid interfaces are discussed and illustrated by Moilliet. These include the possibility of adsorption with reversed orientation, which is compared with amphipathic adsorption, and the possible formation of pseudo-adsorbed layers, to which the Gibbs thermodynamical treatment cannot be applied. The concept of the interfacial tension at solid-liquid interfaces, and the effect thereon of the adsorption of surface-active materials, are also examined. Practical effects which are achieved by the adsorption of surface-active agents at solid-liquid interfaces are briefly summarized. JOCCA, 38, #8, 8/55, p. 463

24.5.7. The Emulsol Chemical Corporation issued bulletins #44, and 45 describing the Emcol 5000 Series (fatty alkanolamides) and Emcol E-11 (alkyl benzyl triethyl ammonium chloride).

Manufacturers:
Atlantic Refining Company
American Cyanamid Company
Antara Chemicals
Armour Chemical Division
Atlas Powder Company
Carbide & Carbon Chemicals Company
Commercial Solvents Corporation
Fallek Products Company, Inc.
Geigy Industrial Chemicals
The Girdler Company
Glyco Products Co., Inc.
Hercules Powder Company
Kraft Chemical Company, Inc.
Mona Industries, Inc.
National Aniline Division
Nopco Chemical Company
Nuodex Products Co., Inc.
Onyx Oil & Chemical Company
Oronite Chemical Company
The Pacific Lumber Company
Pennsylvania Refining Company
Petrochemicals Company
Raybo Chemical Company
Rohm & Haas Company
Sharples Chemicals, Inc.
Synthetic Chemicals, Inc.

PRESCRIPTION for improving performance of exterior housepaints

Rx Thixcin®

use 5 lbs. per 100 gallons

for

THIXCIN makes formulating easier, allows a wider choice of materials and composition, assures more reliable control of rheological properties.

For sample and technical literature write to

- Outstanding Pigment Suspension
- Better Brushability
- Longer Shelf Stability
- Easier Re-dispersion of Pigment
- Smoother Appearance
- Moderate Viscosity Increase

THE Baker CASTOR OIL COMPANY
ESTABLISHED 1857
120 Broadway, New York 5, N.Y.

Troy Chemical Company
Ultra Chemical Works, Inc.
West Virginia Pulp & Paper Company
Witco Chemical Company
Wyandotte Chemicals Corporation
R. T. Vanderbilt Co., Inc.

24.6. (No abstracts)

Manufacturers:

Advance Solvents & Chemical Corp.
Central Soya Co., Inc.
W. A. Cleary Corporation
Glyco Products Company, Inc.
Marathon Corporation
National Aniline Division
Nopco Chemical Company
Nuodex Products Co., Inc.
Ross & Rowe Inc.
Semet-Solvay Co., Petrochemicals Div.
Troy Chemical Company
R. T. Vanderbilt Co., Inc.
Witco Chemical Company

24.7.1. The Antata Chemicals Division of General Aniline & Film Corporation issued a 40-page revision of their booklet describing Antara detergents, wetting agents, emulsifiers, etc.

24.7.2. The Armour Chemical Division issued 12-page booklet describing "Armacs"—a group of acetic acid salts of fatty amines. These emulsifiers are cationic and are preferentially adsorbed onto both metallic and non-metallic surfaces from liquid systems.

24.7.3. The Carbide & Carbon Chemicals Company issued 92-page, ninth edition of their book on "Emulsions and Detergents".

24.7.4. The Witco Chemical Company issued bulletins H-2, H-3, and H-4 describing Witco DGL, DGO, and GMO, emulsifying agents.

cf:
18.1.3

Manufacturers:
Antara Chemicals
Armour Chemical Division
Atlantic Refining Company
Atlas Powder Company
The Borden Co., Chemical Div.
Carbide & Carbon Chemicals Company
The Dow Chemical Company
Emery Industries, Inc.
The Emulsol Corporation
Geigy Industrial Chemicals
Glyco Products Co., Inc.
Hercules Powder Company
Jefferson Chemical Co., Inc.
Kraft Chemical Co., Inc.
Ninol Laboratories
Nopco Chemical Company
Onyx Oil & Chemical Company
Oronite Chemical Company
Pennsylvania Refining Company
Petrochemicals Div.
Ross & Rowe, Inc.
Sharples Chemicals, Inc.
A. E. Staley Mfg. Co.
Synthetic Chemicals, Inc.
Universal Chemicals Corporation
Witco Chemical Company
Wyandotte Chemicals Corporation

24.8.1. Salzberg discusses casein stabilizers for latex paints. This discussion is confined to the styrene copolymer and straight styrene types of paint. The author reviews the following subjects: nature of protein stabilizers, requisites for casein stabilizers, prepared casein stabilizers, preservatives, stabilizers for calcium-base pigments, thickeners, viscosity stability, freeze-thaw stability, method of preparing stabilizer, and stabilizer cost. PVP, 44, #10, 10/54, p. 35

24.8.2. The discoloration that takes place when vinyl chloride resin compounds are heated or exposed to ultraviolet can be minimized by the incorporation of suitable stabilizers. The degree of color protection imparted depends on the chemical nature of the stabilizing agent. Information on the underlying causes for the types of behavior found is needed for the design of better stabilizing agents.

As a class, vinyl chloride resin stabilizers are compounds capable of reacting with and neutralizing the hydrogen chloride formed by resin degradation. An analytical method is described, by Wartman, for measuring the amount of chlorine reaction products formed in practical resin formulations. Results obtained by this method are correlated with color degradation effects during thermal processing and accelerated ultraviolet

WITCO

your reliable source for quality paint chemicals

Because they're made in Witco's own modern plants under strictest control techniques—to assure you of a pure, uniform product every time. And Witco's skilled service staff has long experience in serving the paint industry. So call on Witco when you need:

STEARATES

Aluminum—for improved suspension and flatting
Calcium—for flatting with minimum gelation
Magnesium—flatting agent insoluble in many paint vehicles at elevated temperatures
Sodium—stabilizer for water-base paints
Zinc—sanding sealer for varnishes and lacquers

DRIERS

Naphthenic—lead, cobalt, calcium, manganese, zinc, iron
Octoic—lead, cobalt, zinc, calcium
Witall® (tallate)—lead, cobalt, manganese, iron

PAINT BLACKS

Witcoblak® No. 50—low-cost channel black for utility use
Witcoblak No. 55—densed powder form of No. 50 for cleaner handling
Witcoblak No. 11—low color channel black, semi-pelletized
Witcoblak No. 12—pelletized regular color channel black for ball mill production
*Witcoblak No. 32—a jetter black at low cost
*Witcoblak No. 100—medium color black, next jetter grade
*Witcoblak Hitone—jettest medium color black, channel grade
*Witcoblak F-1—blue tone furnace black providing high strength at low cost, for tinting
*Witcoblak F-2—jetter masstone, higher tinting strength, blue tone furnace black
*Witcoblak F-3—jettest masstone, highest tinting strength furnace black

*Available in powder or pelletized form

EXTENDER PIGMENTS

Witcarb® R—ultrafine, precipitated calcium carbonate...the whitest extender pigment available

Technical literature and samples available on request.

WITCO CHEMICAL COMPANY
122 East 42nd Street, New York 17, N. Y.
Chicago • Boston • Akron • Atlanta • Houston • Los Angeles
San Francisco • London and Manchester, England

36 Years of Growth

Preview of PERMAGEL Properties
Prime advantage of Permagel is its needle-like particle shape, which approaches colloid chemistry's ideal for forming controlled gel structures.
Excellent suspending properties. (Left) TiO2 suspension in water with Permagel as suspending agent. (Right) Same mixture without Permagel.
WITH HEAT-STABLE PERMAGEL THICKENING AGENT
WITH NON-HEAT-STABLE ORDINARY THICKENING AGENT
70°F
110°F

PERMAGEL®

...new highly effective agent for thickening, gelling, imparting thixotropic body

Remarkable Properties, Low In Cost—Permagel is an entirely inorganic purified colloidal form of attapulgite which provides a striking combination of properties for application in the paint industry. It is highly effective as an emulsifier, emulsion stabilizer, heat-stable thixotropic thickener, and suspending agent for pigments. It prevents sagging, aids brushability, eliminates ropiness.

One Thickener For Both Systems—Flexible in operation, Permagel is efficient as a thickening or gelling agent for imparting thixotropic body to both aqueous and organic systems.

Merits Investigation—Check your needs on the coupon. M&C's paint specialists at Minerals Research Center will be pleased to work with you.

ATTAPULGUS **ATTAPULGUS PRODUCTS** *from*

MINERALS & CHEMICALS CORPORATION OF AMERICA
34 ESSEX TURNPIKE, MENLO PARK, NEW JERSEY

SERVING OVER 800 PAINT MANUFACTURERS FROM WAREHOUSE STOCKS IN 28 CITIES

MINERALS & CHEMICALS CORPORATION OF AMERICA
34 Essex Turnpike, Menlo Park, New Jersey
Please send me:
☐ Complete, up-to-date technical literature
☐ A generous sample of Permagel for evaluation as

_____
_____
name _____ title _____
company _____
address _____
city _____ zone _____ state _____

Have You Tried?

The Preblend Method Using "Sotex Dispersing Agents"

- **SOTEX DISPERSING AGENTS** will increase production by shortening the milling cycle.
- **LARGER QUANTITIES** of pigment can be ground in vehicles without an increase in yield value.
- **SOTEX NON-IONIC AGENTS** are co-solvents insuring stability of final product.
- **PRODUCTION PER MILL** can be doubled by the use of SOTEX AGENTS and this new technique.
- **A TEST RUN** by this method in your plant will be most convincing.

Our Technical Staff is Available For Demonstrations.

FOR TECHNICAL DATA AND SAMPLES WRITE, WIRE OR PHONE

SYNTHETIC CHEMICALS, INC.

335 McLean Boulevard
Paterson 4, N. J.

Phone
Mulberry 4-1726-7

Cable Address
Patchem Paterson

exposure. The efficiency of the hydrogen chloride scavenging action of various stabilizers has also been determined by measuring the amount of hydrogen chloride the stabilizer allows to escape from the surface of a heated sample containing the stabilizers.

Discoloration of vinyl chloride resin compounds in the presence of stabilizers is a complicated phenomenon, most aspects of which are poorly understood. Slow hydrogen chloride pickup by a stabilizer is apparently one cause of poor color stability. IEC, 47, #5, 5/55, p. 1013

24.8.3. Dean & Manasia describe how stabilizers can be used to retard darkening of cured polyester resins caused by exposure to ultraviolet light. IR, 13, #4, Winter 54-55, p. 91

24.8.4. A composition of matter comprising a chlorine-containing polyvinyl resin and from 0.01% to 5% by weight of the resin of a polyester condensation product of an aliphatic mercapto alcohol and a dicarboxylic acid, said dicarboxylic acid having the carboxylic acid radicals thereof joined by a hydrocarbon group. USP 2,707,178

24.8.5. The Rohm & Haas Company issued 11-page bulletin describing octylphenol and nonylphenol.

cf:
17.1.1
Manufacturers:
Advance Solvents & Chemical Corporation
Carbide & Carbon Chemicals Company
Ferro Corporation
The Harshaw Chemical Company
Harwick Standard Chemical Company
Metal & Thermit Corporation
Minnesota Mining & Mfg. Company
National Lead Company
Nopco Chemical Company
Witco Chemical Company

24.9.1. The Rohm & Haas Company issued 5-page bulletin describing acrysol G-110, thickener and stabilizer for latices.

cf:
1.2.20
24.8.1
Manufacturers:
Advance Solvents & Chemical Corporation
Baker Castor Oil Company
The Borden Co., Chemical Div., Polyco Dept.
Brown-Allen Chemicals, Inc.
Buckeye Cotton Oil Company
Carbide & Carbon Chemicals Company
Croda Incorporated
J. M. Huber Corporation
Minerals & Chemicals Corp. of America
Minnesota Mining & Mfg. Company
National Lead Company
Nopco Chemical Company
Nuodex Products Co., Inc.
Raybo Chemical Company
Rohm & Haas Company
A. E. Staley Mfg. Co.
Fred'k A. Stresen-Reuter, Inc.
Troy Chemical Company
Viscatone Chemical Co.
Witco Chemical Company

24.10.1. Ridenour, et al, determined experimentally the solubilities of argon, carbon dioxide, methane, nitrogen and oxygen in molten paraffin wax at 72.2°C. and of oxygen and nitrogen in molten microcrystalline wax at 81.6°C, over a pressure range from about 200 to 800 mm. of mercury. The results are presented in graphical and tubular form and compared with data for other petroleum products from the literature. A new method for predicting such solubility data has been developed. IEC, 46, #11, 11/54, p. 2376

24.10.2. Sutton describes some investigations with long chain compounds. Wool wax, human hair wax, South African Pilchard oil, some unusual vegetable oil fatty acids, thermal polymerization of triglyceride oils, dehydro-polymerization of long chain compounds with di-tert-butyl peroxide, and autoxidation of methyl lineate, are included. JAOCS, 32, #1, 1/55, p. 16

24.10.3. Turner, et al, studied the relation of the composition of paraffin waxes, as determined by mass spectrometer analysis, to melting point, blocking temperature, penetration, and tensile strength.

Mass spectrometer analysis should be a valuable tool for predicting the performance of waxes and developing improved wax products. IEC, 47, #6, 6/55, p. 1219

24.10.4. Coffman, et al, have synthesized a new family of polyamines by reductive amination of the polyketones which result from copolymerization of ethylene and carbon monoxide. They have the structure of a long-chain hydrocarbon with lateral primary, secondary or tertiary amine groups. They range in physical form from liquids to microcrystalline waxes. The structure has been confirmed both by infrared spectra and by formation of typical amine derivatives such as salts, amides, N-oxides and ureas. JACS, 76, #24, 12/20/54, p. 6394

24.10.5. Ridenour and Bowman discuss the effect of streamlining on stresses in the Perkins Tensile Strength Briquet for refined paraffin waxes. This is a review of events leading to adoption of the Mellon modified Perkins mold for the tensile strength of paraffin wax. ASTM, #207, 7/55, p. 59

24.10.6. An improved wax composition comprising a major amount of a paraffin wax and a minor amount, sufficient to inhibit development of oxidized odors and significant amounts of acidic decomposition products in the wax during contact thereof with oxygen at temperatures of as great as 180°F., for a period at least 24 hours in excess of the period of natural resistance of said wax, at the same temperature, to development of oxidized odors and significant amounts of acidic decomposition products, of an inhibitor comprising a bis (2-hydroxy-3-t-butyl-5-methylphenyl) alkane, where the alkane portion of the molecule contains not more than 2 carbon atoms, said minor amount ranging from about 0.0001 to about 0.01 per cent by weight of the composition. USP 2,692,835

Manufacturers:
Bakelite Company
The Baker Castor Oil Company
Bareco Oil Company
H. L. Barnebey
Dura Commodities Corporation
Eastman Chemical Products, Inc.
Glyco Products Co., Inc.
International Wax Refining Corporation
National Wax Company
Petrolite Corporation, Ltd.
Frank B. Ross Company
Standard Oil Company of Calif.
Sun Oil Company
Warwick Wax Company, Inc.

24.11.1. The General Electric Company issued 3-page data sheet AD-16A on the Use of GE Silicones in Defoaming. Also data sheet on anti-foam 60; a silicone anti-foam emulsion.

Manufacturers:
Dow Corning Corporation
El Dorado Oil Works
General Electric Co., Chemical Materials Dept., Silicone Products
Glyco Products Co., Inc.
Kraft Chemical Co., Inc.
Monsanto Chemical Company
Nopco Chemical Company
Swift & Company

24.12. (No abstracts)

Manufacturers:
American Cyanamid Company
Antara Chemicals
General Dyestuff Corp.

24.13.1. A process of preparing a flameproofing composition comprising subjecting an aqueous emulsion containing (1) a methane derivative of the formula CX_2Y_2 wherein X is a member selected from the group consisting of chlorine and bromine and Y is a member selected from the group consisting of hydrogen, chlorine and bromine, (2) a polymerizable, neutral, unsaturated alcohol ester of phosphoric acid, and (3) a water-soluble peroxidic polymerization catalyst as the sole catalyst, to heating at a temperature below about 200°C. at which the catalyst forms free radicals and until the emulsion becomes an equous suspension in which the non-aqueous phase contains a dispersed polymer having phosphate and halomethyl groups. USP 2,686,768

24.13.2. A process of preparing a flameproofing composition comprising subjecting an aqueous emulsion containing (1) a methane derivative of the formula CX_2X_2 wherein X is a member selected from the group consisting of chlorine and bromine and Y is a member selected from the group consisting of hydrogen, chlorine and bromine, (2) a polymerizable, neutral, unsaturated alcohol ester of phosphoric acid. (3) an alkali metal bicarbonate in an amount of about from 5 to 8% of the weight of the said methane derivative and the said phosphoric acid ester, and (4) a water-soluble peroxidic polymerization catalyst as the sole catalyst, to heating at a temperature below about 200°C. at which the catalyst forms free radicals and until the emulsion becomes an aqueous suspension in which the nonaqueous phase contains a dispersed polymer having phosphate and halomethyl groups. USP 2,686,769

24.13.3. A dilute solution adapted for imparting fire resistance to light weight cellulosic materials, comprising an aqueous solution of hydrochloric acid and a titanium chloride acylate, said acylate being selected from the group consisting of formate, acetate and propionate, said titanium being present in amount from 15 to 40 grams per liter, said acylate being present in amount from 1.0 to 4.6 grams for each gram of titanium said acylate amounting to not less than 15 nor more than 184 grams per liter, the chloride values of said titanium chloride acylate and said hydrochloric acid being present in amount aggregating from 90 to 200 grams of Cl per liter. USP 2,691,594

Manufacturers:
American Potash & Chemical Corporation
Metal & Thermit Corporation
Pacific Coast Borax Company

24.14.1. Clarke & Arnold review methods and materials for preventing the skinning of paint. This is accomplished in three ways: preventing access of oxygen, by dissolution of the skin, or by inhibiting the skin-forming reaction.

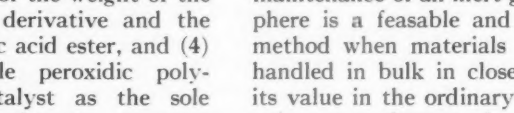
Preventing oxygen access by maintenance of an inert-gas atmosphere is a feasable and economic method when materials are being handled in bulk in closed vessels; its value in the ordinary course of paint manufacture is doubtful. Dissolution of the skin as it forms is usually unattractive. Inhibition of the skin-forming reaction involves interference with the drying of the paint, and achievement of a suitable balance will always be delicate and frequently impossible. JOCCA, 38, #4, 4/55, p. 191

Manufacturers:
Advance Solvents & Chemical Corporation
Magnus, Mabee & Reyard, Inc.
National Aniline Division
Naftone, Inc.
Nuodex Products Co., Inc.
Raybo Chemical Co.
Troy Chemical Company

24.15.1. Consumer demand for odorless paints is stimulating new interest in neutralizing techniques. Pantaleoni discusses odor control in paints. Odor control, neutralizing odors, and evaluation are included. PVP, 45, #3, 3/55, p. 32

Manufacturers:
Aromatic Products, Inc.
Dodge & Olcott, Inc.
Florida Molasses Corporation
Fritzsche Brothers, Inc.
Givaudan-Delawanna, Inc.
Magnus, Mabee & Reynard, Inc.
Rhodia, Inc.
Sindar Corporation
Van Amerlingen-Haebler, Inc.

24.16.1. A composition of matter comprising (1) a heat-hardenable hydrocarbon-substituted polysiloxane resin, containing an average of more than 1 and less than 2 hydrocarbon groups per silicon atom and (2) a curing catalyst for the said resin comprising aluminum crotonate having the formula



the said curing agent being present in an amount sufficient to convert the said resin in the presence of heat to a cured, tack-free state. USP 2.714.585

CHAPTER 25

INTERMEDIATES

25.1.1. Drubel, et al, describe Dow Resin 622, a new resinous polyalcohol for the coatings industry. This polyalcohol offers:

1. Rapid esterification at relatively low temperatures
2. Excellent solution and film color
3. Excellent solubility in aliphatic solvents
4. Fast drying
5. Excellent alkali and water resistance
6. Excellent adhesion, abrasion and impact resistance
7. Good durability. APJ, 39, #25, 3/7/55, p. 84

25.2.1. Oronite Chemical takes the wraps off isophthalic, and exciting alkyd resin intermediate. Structure, behavior differences, cooking techniques, exterior data, heat stability and house paints, testing tall oil, and other advantages are discussed. POCR, 118, #3, 2/10/55, p. 10

25.2.2. Elwell discusses Oronite isophthalic. Although isophthalic is chemically similar to phthalic anhydride, it is quite different in physical properties. Its structure makes it an excellent raw material for superior alkyd resins and unsaturated polyesters. APJ, 39, #29, 4/4/55, p. 76

25.2.3. Kadesch reviews dibasic acids. Their occurrence, synthesis, reactions, and uses are described. Uses described include simple esters, polyesters, polyamides, salts and soaps, amides, and miscellaneous polymers. The dibasic acids themselves can be used as such. JAOCS, 31, #11, 11/54, p. 568

25.2.4. The Borden Company issued 4-page bulletin M-1 describing fumaric acid and derivatives —properties and uses.

25.2.5. Chas Pfizer & Co. Inc. issued 20-page Technical Bulletin #82 describing Itaconic acid.

Manufacturers:
American Cyanamid Company
Archer-Daniels-Midland Company
Barrett Div., Allied Chemical & Dye Corp.
Carbide & Carbon Chemicals Company
E. I. Dupont de Nemours & Co., Inc.
Emery Industries, Inc.
Evans Chemicals, Inc.
Hercules Powder Company
Humphrey-Wilkinson, Inc.
Koppers Company, Inc.
Mallinckrodt Chemical Works
Monsanto Chemical Corporation
National Aniline Division
Oronite Chemical Company
Pittsburgh Coke & Chemical Company
Chas. Pfizer & Co., Inc.
Reichhold Chemicals, Inc.
Shell Chemical Corporation
U. S. Industrial Chemicals Company
Velsicol Corporation

25.3.1. Drubel, et al, discuss Dow 622, a new resinous polyol for the coatings industry. Advantages include:

1. rapid esterification at relatively low temperatures
2. excellent solution and film color
3. excellent solubility in aliphatic solvents
4. fast drying
5. excellent alkali and water resistance
6. excellent adhesion, abrasion resistance
7. good durability

POCR, 118, #4, 2/24/55, p. 9

25.3.2. Pattison reviews changing times for glycerine. The story of glycerine in 1954 was not one of its more dramatic chapters. APJ, 39, #23, 2/21/55, p. 77

25.3.3. Drubel, et al, discuss Dow Resin 622, a resinous polyol containing a number of hydroxyl groups, can be esterified to form drying oil type coatings. Preparation of esters, properties of esters, methods of altering viscosity, modified Dow Resin 622 esters, vinyl monomer modification and bake finishes are discussed. PVP, 45, #5, 4/55, p.25

25.3.4. Michael discusses the use of 2,2,6,6,-tetramethylolcyclohexanol in alkyd resins and related coating vehicles. The purpose of this paper is to indicate some of its properties and some ways in which it may be used. The following are included: synthetic drying oils, alkyd resins and rosin esters. The use of this polyol results in increased viscosity, shorter drying time, increased water and alkali resistance. Its use in alkyds appears to retard skinning. OD, 27, #364, 5/55, p. 273

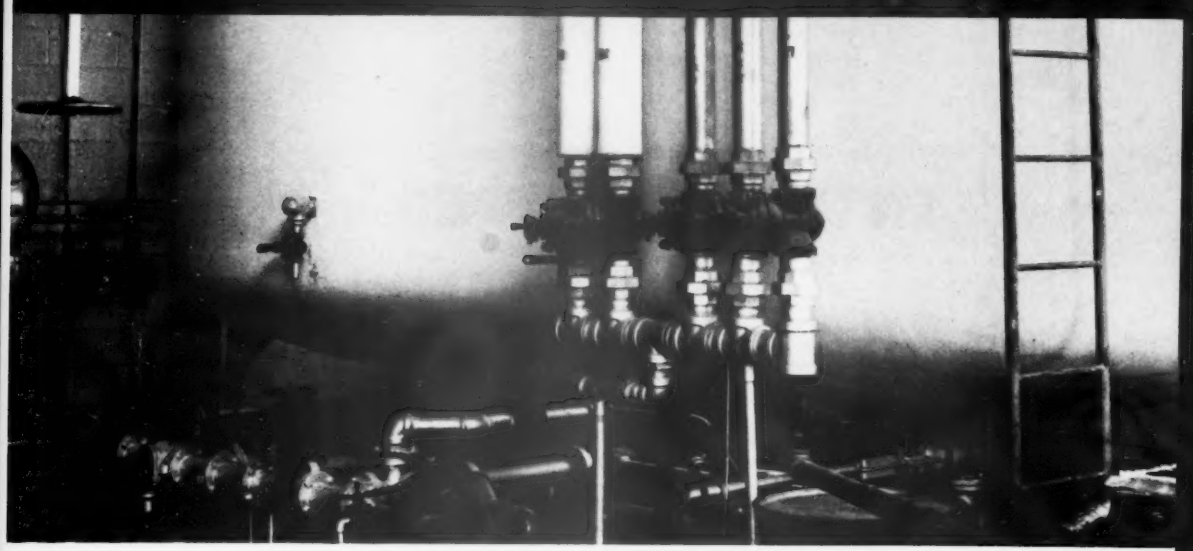
25.3.5. Krutz, et al present a new method of analyzing mixtures containing monoglyceride and glycerin. It is based upon oxidation of the sample with periodic acid and is more rapid than the older methods because it is not necessary to separate the two layers when the glycerin is extracted from the solution of the sample. Precision of the titrations is improved. JAOCS, 31, #11, 11/54 p. 466

25.3.6. Delaware Chemicals, Inc. issued 28-page booklet "Pentaerythritol in Synthetic Vehicles".

25.3.7. The Dow Chemical Company issued 25-page Bulletin—Dow Resin 622 in Surface Coatings. Resin 622 is a hard resinous polyhydric alcohol.

cf:
4.1.8
32.2.1

Manufacturers:
Atlas Powder Company
Celanese Corp. of America
Commercial Solvents Corporation
Corn Products Refining Company
Delaware Chemicals, Inc.



STANDARDIZE ON MONSANTO FOR PROFITS IN PAINT

- **PHTHALIC ANHYDRIDE**
- **MALEIC ANHYDRIDE**
- **ADIPIC ACID**
- **FUMARIC ACID**

You can control costs, save time, make your quality control easier—when you make Monsanto your prime contract supplier.

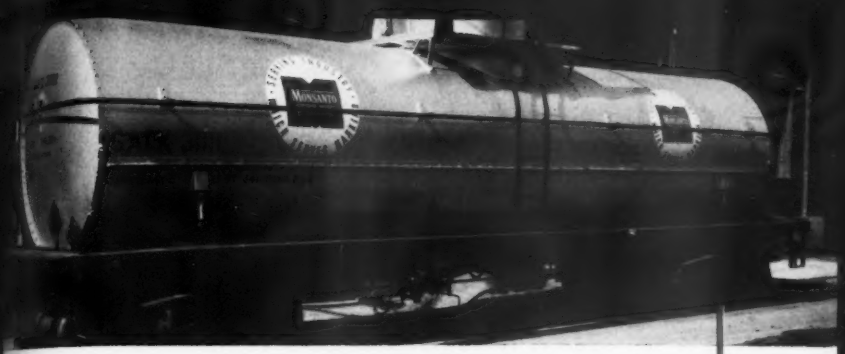
FOUR of the most important alkyd and polyester polybasic acids from ONE supplier to simplify your purchasing. With Monsanto as your supplier, you get:

Quality raw materials that set the industry standard • Delivery when you want it • Uniformity you can depend on, shipment to shipment • Mixed shipments for closer inventory control and economy • Technical help on processing and handling problems.

You'll find lots of advantages—working with the *leader*... in paint making raw materials. Monsanto was the first American producer of phthalic anhydride (1916); a pioneer in developing new physical forms (molten phthalic, maleic briquettes); and handling methods (combination shipment, palletized bags). More important—you learn new tricks-of-the-trade in processing—as fast as Monsanto's research develops new fundamental knowledge of processing technology.

PROCESSING SPECIALTIES, TOO!

Triphenyl phosphite, supplied *only by Monsanto,* helps you improve the color of alkyds and epoxy vehicles. Add as little as 0.25% on the weight of the oil—and you can eliminate filtering. Your finished resin will be clear—because the triphenyl



MALEIC ANHYDRIDE

PHTHALIC ANHYDRIDE
FUMARIC ACID
ADIPIC ACID

phosphite solubilizes the calcium catalyst used for alcoholysis.

CUTS BAKING TIME FOR FORTIFIED ALKYDS

Triphenyl phosphite also acts as a catalyst in short oil alkyds. When these are combined with melamine or urea resins for automotive, appliance, or other baking enamels—the baking cycles are reduced, saving the user valuable production time in his finishing operation.

Your Monsanto representative will call in the next thirty days. Discuss contract coverage with him, or write Organic Chemicals Division, Monsanto Chemical Company, Department PC-1, 800 North Twelfth Boulevard, St. Louis, Missouri.

MONSANTO®

Where Creative Chemistry Works Wonders for You

Dow Chemical Company
Eastman Chemical Products, Inc.
El Dorado Oil Works
Glycerine Corp. of America
Hercules Powder Company
Heyden Chemical Corporation
Kay-Fries Chemicals, Inc.
Procter & Gamble
Reichhold Chemicals, Inc.
Reilly Tar & Chemical Corporation
Shell Chemical Company
Trojan Powder Company
Westvaco Chemical Division
Wyandotte Chemicals Corporation

25.4.1. New distillation technique not only helps formaldehyde shed its water content, but also transforms pure product into solid formaldehyde polymers. CE, 62, #4, 4/55, p. 234

25.4.2. A new method for detecting formaldehyde by means of a spot test on reagent paper has been developed, by West & Sen. As little as 0.5 γ of formaldehyde can be detected. The test can be used as a semiquantitive method and is essentially free from interference. AC, 27, #9, 9/55, p. 1460

Manufacturers:
Celanese Corp. of America
Commercial Solvents Corporation
Heyden Chemical Corporation
Kay-Fries Chemicals, Inc.
Reilly Tar & Chemical Corporation
Westvaco Chemical Division

25.5. (No abstracts)

cf:
32.1.3

Manufacturers:
Ethyl Corporation
Guardian Chemical Corporation
Jefferson Chemical Co., Inc.
Monsanto Chemical Company
Rohm & Haas Company

25.6.1. The Sharples Chemicals Division of Pennsylvania Salt Manufacturing Company issued 52-page report 55-1 describing Sharples Amines—Physical & Chemical properties and applications.

Manufacturers:
Sharples Chemicals, Inc.

25.7.1. Pufahl reviews raw materials for new latex paint vehicles. After a brief look at the markets for latex paints, the author discusses raw materials, characteristics of the monomers, selection of monomers, and comonomers for latex paints. 48 monomers listed are those which have already reached manufacture at semicommercial or commercial scale. Behind these are many more unsaturated compounds in the research stages in laboratories. PVP, 45, #1, 1/55, p. 23

25.7.2. Buege, et al, review vinyltoluene in paints and varnishes. Although the development of vinyltoluene modified oils and alkyds is relatively new, laboratory data indicates these vehicles will be very useful in protective coatings for the following reasons:

1. Formulating with vinyltoluene offers the vehicle formulator the use of a wide range of commonly used drying and semi-drying oils, low cost aliphatic solvents, and satisfactory processing time.
2. Oils and alkyds modified with vinyltoluene are characterized by fast dry, good chemical resistance, excellent color and color retention, suggesting broad usage in trade sales as well as industrial finishes.
3. Vinyltoluene/divinylbenzene/drying oil compositions represent another new class of vehicles which to date show promise in finishes such as non-penetrating flat wall paints.
4. Vinyltoluene as a raw material offers uniformity and ready availability which are essential in the modern protective coatings industry. OD, 27, #362, 3/55, p. 148

25.7.3. A number of aromatic hydrocarbons have been tested, by Marvel and Anderson, as comonomers for copolymerization with 1,3-butadiene. Anthracene, pyrene, and trans-stilbene form copolymers having marked ultraviolet absorption. Under similar conditions benzene, naphthalene, phenanthrene and cis-stilbene do not give copolymers with detectable absorption maxima. The reactivities of these aromatic compounds fall in an order predicted from their free valence numbers as calculated by the molecular orbital method. These calculations predict high reactivity for several as yet untested polynuclear systems. JACS, 76, #21, 11/5/54, p. 5434

25.7.4. Monovinylacetylene, divinylacetylene, 1,3-butadienylacetylene, 1,3,7-octatrien-5yne, and a 7-yne acetylene tetramer thought to be 1,3,5-octatrien-7yne have been prepared by the Nieuwland reaction and separated by the high vacuum, fractional distillation-condensation technique. Some of their physical properties have been measured and vapor curves, infrared spectra with band assignments and ultraviolet spectra with extinction coefficients are reported. Mass spectra were obtained but details are not given. The ultraviolet spectra of polymers of monovinylacetylene and divinylacetylene also were obtained. Evidence in support of the 1,3,5-octatrien-7-yne constitution for the 7-yne technique is given and a mechanism of formation is suggested. JACS, 76, #21, 11/5/54, p. 5494

25.7.5. Breslow & Hulse prepared ethylenesulfonic acid by saturating an aqueous solution of sodium ethylenesulfonate with hydrogen chloride, separating precipitated NaCl, and distilling the free acid. It polymerizes readily in aqueous solution in the presence of free-radical catalysts or when exposed to ultraviolet light. Both the rate of polymerization and the molecular weights of the polymers are increased with increased monomer concentration. Ethylenesulfonic acid copolymerizes slowly with methyl acrylate and with acrylonitrile. JACS, 76, #24, 12/20/54, p. 6399

25.7.6. A convenient synthesis of α- and β-alkylstyrenes by the deacetylation of the acetates from carbinols is reported, by Overberger & Tanner. Evidence is presented for the structure of styrenes based on ozonolysis and correlation of fractional distillation data and ultraviolet absorption spectra. Steric inhibition of resonance in the case of α-alkylstyrenes is suggested based on the interpretation of the ultraviolet absorption spectra. JACS, 77, #2, 1/20/55, p. 369

25.7.7. Riddle discusses acrylic monomers in coating vehicles. Polymerization, effect of particle size, acrylates for latex, and solvent systems are covered. The monomeric acrylic esters that are available in commercial qualities include:

Acrylates:	methyl
	ethyl
	butyl
	2-ethylhexyl
Methacrylates:	methyl
	ethyl
	butyl
	hexyl

decyl-octyl
lauryl
stearyl

PVP, 45, #8, 7/55, p. 34

25.7.8. Riddle discusses acrylic monomers in coating vehicles. Both acrylates and methocrylates are reviewed. PIM, 70, #4, 4/55, p. 21

25.7.9. Craig, et al, describe the preparation of long-chain vinyl esters and ethers from commercial raw materials. Preparation of vinyl stearate, vinyl oleate, vinyl actadecyl ether and vinyl oleyl ether are discussed in this article. IEC, 47, #9, 9/55, p. 1702

25.7.10. Redfield studied the commerical preparation of technical grade vinyl stearate. Cost estimate is discussed in this paper. IEC, 47, #9, 9/55, p. 1707

25.7.11. The Borden Company issued bulletin M-18 describing ethylene glycol dimethacrylate, acrylic monomer.

25.7.12. The Carbide & Carbon Chemicals Company issued:

8-page F-7434 describing acrylic esters

10-page F-8047 describing vinyl esters

25.7.13. The Monsanto Chemical Company issued Bulletin #ODB-54-18 describing Dibutyl Fumarate

25.7.14. The National Aniline Division of Allied Chemical & Dye Corporation issued series of technical bulletins #I-17, I-17A, I-17B, I-17C, I-17D, I-17E, describing the Nacconates—National Aniline Diisocyanates.

cf:
2.2.1
7.1.1
32.1.4
32.2.10
38.8.5

Manufacturers:

American Monomer Corporation
The Borden Co., Chemical Div., Monomer Dept.
Carbide & Carbon Chemicals Company
The Carwin Company
The Dow Chemical Company
The Glidden Company
Koppers Company, Inc.
Monsanto Chemical Company
National Aniline Division
Rohm & Haas Company

CHAPTER 26

ARCHITECTURAL COATINGS

26.1.1. Wandersleben, et al, (Cleveland Club) present part II of their study on painting plaster surfaces. This study was aimed at developing an adequate system of grading failures, attempting to correlate results with actual performance, and improving the testing procedure. POCR, 117, #24, 12/2/54, p. 32

26.1.2. Browne discusses some questions about mastic exterior coatings. Strong claims for thick plastic or mastic exterior coatings produce serious doubts. CPVM, 28, #6, 6/54, p. 30

26.1.3. An additive composition for varnishes and oil-based paints consisting essentially of a mixture containing from about 0.8 per cent to about 2.2 per cent benzol, from about 1.6 per cent to about 4.4 per cent methyl alcohol, from about 0.2 per cent to about 2.2 per cent glycerine, from about 8.8 per cent to about 9.5 per cent turpentine, and from about 82.4 per cent to about 88.0 per cent pure raw linseed oil. USP 2,692,208

26.1.4. An article of manufacture comprising sheet iron which has been coated with a composition consisting essentially of 8 to 14 parts of calcium naphthanate, 112 parts coumarone-indene resin, 10 to 50 parts paraffin oil, 250 to 350 parts of an aromatic hydrocarbon solvent, all of said portions being by weight, and sufficient aluminum powder to yield a paint having two pounds of metallic aluminum per gallon. USP 2,694,-691

26.1.5. A method of amplifying ready mixed commercial oil paint, comprising first, dissolve 5 lbs. of rosin in 2 gals. of methyl alcohol and allow the result to stand for twenty-four hours; next, dissolve three lbs. of gum arabic in a small amount of water; third, stir in 20 gals. of water for about 5 minutes 2 lbs. of lead acetate, 2 lbs, of zinc acetate, 1 lb. of caustic soda, 1 lb. of water glass, and 1 lb. of Irish moss; fourth, add the dissolved rosin and the dissolved gum arabic to the contents of step third and add sufficient water to make a total of 50 gallons; fifth, allow the latter to stand for a few hours; sixth, mix 9 gallons of water to each gallon of the 50 gallons to make a total of 450 gallons; and to each of the 450 resultant gallons mix well one gallon of thoroughly mixed commercially prepared oil paint. USP 2,714,073

cf:
1.2.17
21.3.4
37.1.1

26.2.1. The Cleveland Club presents Part II of their study on the painting of plaster surfaces. Additional work on their accelerated test for the evaluation of paint coatings on plaster is discussed. OD, 26, #358, 11/54, p. 1025

26.2.2. Opp, et al, (CDIC Club) present the results of a systematic study of low odor alkyd paints. Conclusions are presented for stability, skinning, air drying, viscosity, reduction of paints, washability, scrubbing, absorption, odor rating-mineral spirits, odor rating-odorless thinner, odor rating-mineral spirits vs. odorless thinner. POCR, 117, #24, 12/2/54, p. 73

26.2.3. Stieg & Burns present the second part of their paper on how pigmentation affects flat wall paints. Desired properties of non-penetration, enamel hold-out, color uniformity, and sheen uniformity are directly related to pigmentation. CPVM, 28, #6, 6/54, p. 24

26.2.4. Prane discusses the statistical evaluation of odor levels in flat wall paints. PIM, 70, #9, 9/55, p. 22

26.3.1. The Baltimore Club presents the results of a study on the formulation of fire retardant paints. Three figures are presented. The first shows the relationship of the fire-retardant Index (FR#) to the total percent chlorine in the vehicle. The second shows the relationship of the $Sb_2 O_3$ to the fire retardant index (FR#). The third is an attempt to correlate the $Sb_2 O_3$/Chlorine ratio with the fire-retardant Index.

Application of twice the normal weight of paint (corr to 250ft²/gallon) greatly enhances the fire retarding properties of these paints. OD, 26, #358, 11/54, p. 1059

26.3.2. Crippen, et al, (Baltimore Club) report on studies on the formulation of fire retardant paints. The purpose of this study is to discover the factors for developing the best fire retardant paints of the type that will protect wood and similar combustible surfaces from catching fire. These paints may be used alone or over a primer, such as the intumescent type paint as primer. POCR, 117, #24, 12/2/54, p. 40

26.3.3. Brushwell presents part I of "Fire Retardant Paints." Following an introduction, the following are discussed: good properties needed, mechanisms for fire retardancy, the need for fire retardant coatings, and test methods ("stick & wick" test, and cabinet method). APJ, 39, #40, 6/20/55, p. 24

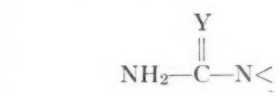
26.3.4. Brushwell continues his article on fire retardant paints. He discusses Federal Specification

SS-A-118a, the Underwriter's test, the Factory Mutual test, the class F fire test, the Hydro-Electric Power Commission tests, the Canadian Forest Products Division test, the Forest Products test, the Navy tests, the thermoelectric fire test, the Wright Air Center tests, the Truax-Harrison method, and formulation of fire-retardant coatings. APJ, 39, #45, 7/25/55, p. 62

26.3.5. Brushwell concludes his article on fire retardant paints. He discusses cloth treatment, acoustical surfaces, wood and metal paints, paints based on chlorinated plasticizers, emulsion paints, mastics, and miscellaneous formulations. APJ, 39, #48, 8/15/55, p. 74

26.3.6. Fire-retardant coatings are covered in a series of nine papers presented at the 123rd meeting of the American Chemical Society. M, 25, #9, 9/55, p. 343

26.3.7. A fire-retardant composition comprising (1) a water-dispersible, heat-convertible condensation product of an aldehyde and an amino compound containing from 1 to 9 carbon atoms and having the grouping



where Y is a member selected from the class consisting of O, S and N— and where the free valences on the nitrogen atoms are attached to atoms selected from the group consisting of hydrogen and carbon atoms, (2) from 15 to 100%, on the weight of said condensation product, of a water-insoluble reaction product of phosphoryl chloride and ammonia, said reaction product having an atomic ratio of nitrogen to phosphorus within the range of 1.5:1 to 2.0:1, (3) from 20 to 250%, on the weight of said condensation product (1), of a cold-water-insoluble polyhydric compound selected from the group consisting of (*a*) a polypentaerythritol, (*b*) a mixture of a polypentaerythritol and unhydrolyzed starch, (*c*) a mixture of a polypentaerythritol, unhydrolyzed starch and hydrolyzed starch, in which the unhydrolyzed starch comprises the major proportion of the starch materials, and (*d*) starch, the weight ratio of starch materials to polypentaerythritol in mixtures (*b*) and (*c*) being between 10:1 and 1:10, and (4) proteinaceous fibers in an amount of 3 to 35% on the weight of said condensation product (1). USP 2,702,283

cf:
1.2.17
1.2.18

26.4.1. Singer presents Part I of Chapter XIII of his "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter discusses "Other Exterior Finishes." APJ, 39, #7, 11/1/54, p. 64

26.4.2. Singer presents Part III of Chapter XIII of his "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter discusses "Other Exterior Finishes." APJ, 39, #14, 12/20/54, p. 62

26.4.3. Bell, in discussing the subject of exterior coatings, breaks it down into four types of surfaces:

exterior wood siding
metal roofs
asbestos siding
stucco cement finishes

Only a small fraction of exterior paint failures are attributable to the coating. CPVM, 28, #11, 11/54, p. 20

26.4.4. Broeker reviews the development of exterior house paints. The choice of titanium dioxide, choice of extenders, choice of vehicle, blister resistance, and painting yellow pine lumber are included. POCR, 118, #11, 6/2/55, p. 16.

26.4.5. Vannoy reports on new trends in colored house paints, in an article illustrated with color plates. Vehicles in the test exposures include:

1. oil type binders
2. alkyd paints
3. polyvinyl acetate and acrylic emulsions.

OD, 27, #366, 7/55 (Part II), p. 1

26.4.6. Lewis, et al, report on an evaluation of Hysoy (chlorinated soybean oil) in exterior paints.

Hysoy and blends of Hysoy and soybean oil can be used successfully in the formulation of white exterior paints. Such paints compare favorably in outdoor weathering tests with similar paints made with linseed and soybean oils. The principle advantage shown by paints formulated with Hysoy is a decrease in drying time. JAOCS, 32, #5, 5/55, p. 300

26.4.7. Symposium on exterior house paints includes:

Styrene — Butadiene Latexes for Exterior Latex Paints
White Lead Pigments in House Paints
Polyvinyl Acetate Emulsions in Exterior House Paints
Oils for House Paints
Tropical Exterior Paints
Titanium Dioxide Pigments in House Paints
Acrylic Emulsions for House Paints
Inorganic Colors in House Paints
Alkyd Resins for House Paints
Zinc Oxide in Exterior House Paints
Extenders in House Paints
Thinners in House Paints
Catalysts for Exterior Paints
Developments in Machinery for Producing House Paints
Color Systems in House Paints
PIM, 69, #11, 11/54, p. 25

26.4.8. Broeker reviews the development of exterior coatings for wood. PIM, 70, #7, 7/55, p. 9

26.4.9. Patton reports on a study of dehydrated castor oil in exterior white house paints. This evaluation considers the contribution of DCO to white paints from two standpoints, (a) the preparation and application properties of the paint and (b) the ultimate durability of the paint films on aging. In both cases the results obtained show DCO to be an excellent drying oil for formulating quality white house paints. OD, 27, #368, 9/55, p. 627

26.4.10. The American Zinc Sales Company issued the 1954 Azo Survey of Outside White House Paints, White Tinting-Base Paints, White One-coat Paints, produced by 60 paint manufactures.

This is an extension of the survey originally begun in 1941, with paint manufacturered by 15 companies.

cf:
1.2.17

26.5.1. Tator reviews maintenance painting in the process industries. Maintenance painting has been left entirely to the paint foreman and has received little or no competent specialized engineering attention or supervision. Within the past few years a number of plants have experimentally provided competent full-time engineering supervision and adminis-

tration to their maintenance painting operations, and the results were immediate and gratifying. Within 2 years these paint engineers and administrators have effected an average reduction in maintenance painting costs of 30 per cent, with no detraction, rather improvement, in plant appearance and protection.

Industry as a whole is estimated to be spending approximately two billion dollars a year for industrial maintenance painting, ¼ of this being expended for paint materials. With such expenditures, the trend must be toward more efficient maintenance painting. APJ, 39, #31, 4/18/55, p. 40

26.6.1. Lauren discusses organic finishes for concrete floors. Includes why concrete floors are painted, pre-treatment, and type of coatings. OF, 16, #9, 9/55, p. 13

cf:
26.4.3

26.7.1. Texture paint containing a major proportion of bodying materials, pigment and filler, and a minor proportion of binder consisting essentially of starch and water-soluble cellulose ether. USP 2,699,401

CHAPTER 27

INDUSTRIAL COATINGS

27.1.1. Singer presents part I of Chapter XIV of "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter deals with industrial and special maintenance finishes-air dry. APJ, 39, #17, 1/10/55, p. 68

27.1.2. Renfrew, et al, review some work on coatings of polyamide and epoxy resin blends. This work was motivated largely by the need of modern industry for a coating which can be air-dried or baked at mild temperatures to provide a film with properties approximating those of quality coatings baked at high temperatures.

Combinations of epoxy resins with certain polyamides of low molecular weight provide coatings with highly attractive properties. These systems have practical limitations imposed by the short pot life of the mixture and the adverse physiological activity of the volatile amine curing agent. The polyamide resin-epoxy resin combinations offer substantial benefits from the point of view of convenience of handling. The mixtures demonstrate larger working life than amine-cured epoxy systems and carry a minimum of health hazards. Cost savings provide a financial incentive for attention by paint chemists.

The polyamide-epoxy resin combinations provide films that are extremely flexible and have very high impact resistance. This high degree of flexibility is obtained at some sacrifice in chemical and solvent resistance, as compared to the amine-cured epoxy resin systems. Baked systems provide more desirable properties than air-dried coatings, although the latter are superior in many respects to baked varnishes or alkyds. Gloss, adhesion, hardness, and lack of reactivity with pigments are outstanding properties of this new coating system. IEC, 46, #10, 10/54, p. 2226

27.1.3. Singer presents part II of Chapter XIV of "Fundamentals of Paint, Varnish, and Lacquer Technology." This chapter deals with air drying, industrial and special maintenance finishes. APJ, 39, #22, 2/14/55, p. 88

27.1.4. Singer presents Part III of Chapter XIV of Fundamentals" of Paint, Varnish and Lacquer Technology." This chapter deals with air drying industrial and special maintenance finishes. APJ, 39, #27, 3/21/55, p. 100

27.1.5. Chapter XV of Singers "Fundamentals of Paint, Varnish and Lacquer Technology" includes baking industrial finishes. APJ, 39, #36, 5/23/55, p. 78

27.1.6. Singer presents Chapter XV of "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter covers baking industrial finishes. APJ, 39, #38, 6/6/55, p. 88

27.1.7. Chatfield presents a progress report on industrial finishes. PI, 4, #9, 12/54, p. 37

27.1.8. Stewart discusses the "permanent" organic finish which must be made of a vehicle that, unpigmented, will not deteriorate. Paints applied over metals need not be different than those applied over porous surfaces, but the passivation of metal surfaces is important. Resins are available on the market now that do not fail after six years exterior exposure but improper pigmentation can introduce failure. OF, 15, #11, 11/54, p. 10

27.1.9. Grupp discusses results of U. S. Navy study on organic finishes to aid in protecting selenium rectifiers against mercurial fungicides. OF, 16, #3, 3/55, p. 14

27.1.10. Cranmer surveys the present and expected future status of U. S. Navy paints, and shows the importance of ASTM Committee D-1 in providing test methods for controlling the quality of these paints. APJ, 39, #52, 9/12/55, p. 94

27.1.11. Gentieu discusses paint finishes for product engineering. Balanced point systems decorate and protect. The growing use of resins increases the range of properties of paint. Paint technology can provide special finishes for applications where electrical insulation, antibiotic properties or heat resistance is required. PE, 26, #5, 5/55, p. 161

27.1.12. Schleicher reviews floor finishing with emphasis on wood floors. PIM, 70, #1, 1/55, p. 8

27.1.13. Materials and Method Manual No. 119 briefly outlines the major types of permanent finishes that are applied to metal products. It is a useful starting point in the investigation of finishes likely to be suitable for a specific application. It covers:

conversion coatings
organic coatings
metallic coatings
inorganic coatings

MM, 42, #3, 9/55, p. 117

27.1.14. A fluorescent coating composition comprising a suspension of finely divided phosphor particles in a lacquer comprising a cellulosic binder and a solvent therefor which is not substantially misicible with water and also containing about 0.1 to 0.7 per cent, by weight of the phosphor of,

finely dispersed boric acid formed in situ by the incorporation therein of a hydrolyzable boric acid ester together with water in a small amount of about 1% by volume of the lacquer and sufficient to hydrolyze the boric acid ester and a coupling agent which is miscible with water and with said solvent. USP 2,686,156

27.1.15. In a fluorescent coating comprising a suspension of finely divided fluorescent material in a lacquer comprising a cellulosic binder and a solvent therefor which is not substantially miscible with water, the improvement which comprises the presence of a small amount of about 1% by volume of the lacquer of water together with a coupling agent which is miscible with the water and the said solvent. USP 2,686,157

27.1.16. A process of depositing a mirror-like coating on a surface of a solid object comprising applying to said surface a solution consisting essentially of a coating material selected from the group consisting of non-saponifiable hydrocarbon resins and chlorinated hydrocarbon waxes in a volatile organic solvent, permitting said solvent to evaporate thereby depositing on said surface a film consisting essentially of said coating material, and then applying a metallic film over said first-mentioned film by the process of chemical deposition comprising reducing a solution of a metal salt with a solution of a reducing agent. USP 2,689,191

27.1.17. A water base paint for producing a film having good electrical conductivity before drying and reducible by firing after drying to a metallic silver film comprising a finely divided metallic silver pigment, a vehicle of polyvinyl alcohol, water, and an antifoaming agent. USP 2,695,275

27.1.18. A plastic coating composition comprising the water-immiscible gel phase formed by adding to a solution comprising ethyl cellulose and a mixture containing less than 80 per cent by weight of liquid aromatic hydrocarbons and at least 20 per cent by weight of an alcohol selected from the group consisting of methanol, ethanol, normal propanol and isopropanol, water in an amount sufficient to effect a two phase separation. USP 2,698,807

27.1.19. Process for the production of a pigmented water-insoluble film-forming substance substantially devoid of water-soluble salts and suitable for spinning into artificial filaments, from a pigmented preparation containing water-soluble salts, which comprises forming a dough from the salt-containing pigment, a water-insoluble film-forming material having a water imbibition of from about 10% to about 40% at 20° C. and a volatile softening agent for the latter, mechanically working the dough, while evaporating the softening agent to disperse the pigment finely throughout the dough and to break up the pigment particles, continuing the working and evaporation of the softening agent until the latter is substantially all removed and a solid compact intimate mixture of said pigment and said filament-forming material is obtained, and subjecting the solid compact mixture, in such form that no point therein is more than about 0.05 inches from a surface thereof, to an aqueous extraction until the water-soluble salts have been substantially removed. USP 2,701,211

27.1.20. A coating composition comprising (1) the resinous condensation product of 2,2', diphenylol propane and a halohydrin, (2) an amine resin selected from the group consisting of butylated urea/formaldehyde resins, melamine formaldehyde resins, and n-propanol modified urea/formaldehyde resins, and (3) a substituted benzoic acid curing agent selected from the group consisting of salicylic acid, 5-choloro salicylic acid and acetyl salicylic acid. USP 2,703,765

27.1.21. A coating composition comprising (*a*) a polymerizable monomer composition consisting of a diester of methacrylic acid and a glycol, said glycol being selected from the group consisting of diethylene glycol, triethylene glycol, tetrathylene glycol, pentaethylene glycol and a mixture of glycols having the empirical formula HO—$(CH_2—CH_2—O)_n$—H where *n* is an integer from 1 to 20, said mixture of glycols having an average molecular weight in the range of 100 to 300, (*b*) a resinous glycerol mixed ester of phthalic, methacrylic and coconut oil acids, the amount of coconut oil acids being present in an amount corresponding to 10% to 25% of coconut oil based on the weight of mixed ester, (*c*) a mixed polyester of a non-drying oil fatty acid and an olefinically unsaturated dicarboxylic acid, with a mixture of polyhydric alcohols consisting of glycerol, pentaerythritol and a glycol, said glycol being selected from the group consisting of polymethylene glycols and polyethylene glycols, said glycols having not more than 6 carbon atoms in the linear chain separating the hydroxyl groups and (*d*) a volatile hydrocarbon solvent, said (*a*), (*b*) and (*c*) components being present in amounts represented by the area delineated by points JKLMN of the drawing. USP 2,705,702

27.1.22. A substrate having a surface coating comprising polytetrafluoroethylene and at least one water-soluble alkali metal silicate from the group consisting of sodium silicate and potassium silicate, said alkali metal silicate being present in an amount of about 6.0% to 50.0% of the combined weight of polytetrafluoroethylene and said alkali metal silicate, the molar ratio of alkali metal oxide to silicon dioxide in the alkali metal silicate being at least 1:1. USP 2,710,266

27.1.23. A process for coating glass which comprises coating glass with a substantially anhydrous pigment-free organic solvent solution of a straight-chain polymer of a tetraorgano derivative of orthotitanic acid, evaporating the solvent and reacting the polymer with water to form a continuous transparent strongly-adherent water-insensitive coating on the glass. USP 2,710,267

27.1.24. In the application of coatings from solutions in water of at least 2% concentration of proteins, a method of quick setting those coatings which comprises incorporating into the protein solution having a pH of less than 5¼—50% (based on the weight of the protein) of a water soluble aluminum salt, coating out the solution in fluid form onto a surface and fuming the resulting coating with an ammonia containing gas whereby rapid setting of the coating is obtained without chilling of said coating being necessary. USP 2,710,815

cf:
1.2.6
1.2.16
24.1.4
30.2.1

27.2.1. The New England Club presents part VII of its study of primers for ferrous metals in an atmospheric exposure. This study was initiated seven years ago. Only the one coat panels are evaluated as the panels with two or more coats have not failed as yet. Findings on the one coat panels indicate:

1. Alkyds and alkyd varnish or alkyd oil blends provide best protection.
2. Pure red lead paints give good overall protection and excellent scribe protection during their life, but rapid chalking and subsequent erosion causes failure on primers where the vehicle is oil or varnish and only slightly better where alkyds are used.
3. Paints formulated with iron oxide alone show fair overall durability but have poor rust pacifying qualities. Addition of 15% zinc oxide results in improved durability.
4. All blue lead mixed pigment exposures gave poor service.
5. Zinc dust-zinc oxide primers in alkyd and linseed oil show good rust inhibitive qualities but poor overall film durability.
6. As a group, zinc chromate primers in alkyd vehicles have shown the best one coat performance record, both on hot and cold rolled steel.
7. The best systems to date for hot rolled steel are a 50/20/10/20-zinc chromate/zinc oxide/ iron oxide/ talc in VF-842 and 52-MC-21, respectively.
8. Four of the better systems for angles are also among the better systems for flat panels. Two are zinc chromate in alkyd, one is zinc chromate in a phenolic varnish, and the fourth is a red lead in alkyd.
9. The best primer from a cost (RMC=$1.31) as well as a performance standpoint is a 16/15/12/28/28/1-zinc chromate/zinc oxide/titanium dioxide/talc/graphitic mica/litharge in P-296 (modified 52-MC-29). OD, 26, #358, 11/54, p. 1039

27.2.2. Jerome, et al, (N. England Club) present the results of a study of primers for ferrous metals. Summary of their findings are too numerous to present here. POCR, 117, #24, 12/2/54, p. 68

cf:
11.1.3
18.4.2

27.3.1. Neoprene is the best all-around organic coating according to Seymour. He bases his opinion on the neoprene, when compared with other organics, stacks up against what he believes are the ten important criteria for protective coatings exposed to chemical splash and fumes. The ten criteria suggested by Seymour are:

1. It should adhere tenaciously to a properly prepared surface.
2. It should be capable of being readily sprayed or brushed on to yield a pinhole free film having a minimum thickness of 2 mils per coat.
3. It should cure rapidly to form a film which is completely resistant to solvents, acids, alkalies and salts at temperatures up to 200 F.
4. It should be unaffected by sunlight and weather.
5. It should have high tensile strength and elongation.
6. Its properties should remain unchanged for long periods of time under ordinary service conditions.
7. It should be available in a wide variety of colors.
8. It should not require special curing techniques and should be reasonably non-toxic to the applicator.
9. It should be economical and commercially available.
10. It should have a long record of successful performance.

MM, 40, #6, 12/54, p. 93

27.3.2. Cherry discusses red lead paints for galvanized surfaces. Paints specifically suited to galvanized surfaces are necessary. Five formulations based on red lead are presented. These five formulations are believed to be superior for service on galvanized. This is based on 2 year exposures. PVP, 45, #6, 5/55, p. 23

27.3.3. Watts discusses coating pipelines in place internally with plastics. Since 1947 various materials including baked phenolics, air drying vinyls, thermosetting polyesters, furanes and others have been used with varying success for the internal coating in place of pipe lines. Development of high-solids vinyls and amine cured Epoxies has made the process more dependable.

Principal problem in applying the coatings is in surface preparation. The author recommends a scheme involving successive cleaning by abrasion, solvent cleaning, alkaline cleaning and acid cleaning with the necessary intermediate washings. Drying is effected best by aspiration until the coating is thoroughly dry. "Solvent washing" resulting from the condensation of solvent at cool places in the pipe is a primary difficulty in the drying process. Tests of drying times are reported.

Considerable data on economics of internal coating on about 100,000 feet of pipe are given, indicating payout for some types of service in short lines in as short a time as one year. Economics of internal plastic coating are not as good for long lines as for short ones. Several case histories of lining economies are given.

Collaterial benefits in improved flow capacity and reduction of paraffin deposits are reported.

Factors to be considered when planning an internal coating job are given. C, 11, #5, 5/55, p. 28

27.3.4. Tator discusses how vinyl coatings' biggest drawback was licked. Principal disadvantage has been low buildup per coat. Thus five to six coats has been required to build-up a film thickness of 5 mils. Two new developments entirely alter this picture. Hot spray and mastics now yield easily applied coatings of 2 mils or more per coat. This makes vinyl economical for general plant maintenance. CE, 62, #5, 5/55, p. 228

27.3.5. A review of the March 1955 meeting of the Federation Corrosion Committee includes panels, welded panels, randomizing, surface for painting, paint systems, film thickness, exposure sites, marking panels, film thickness measurement, and substrate re-

considered. OD, 27, #365, 6/55, p. 343

27.3.6. Beakes discusses corrosion and corrosion resistant paints. There are several types of corrosion: immersion, underground, atmospheric, and high temperature. The paint man is concerned with corrosion primarily involving moisture and oxidation. Oxide films, protective measures, and procedure to use for protection against corrosion are discussed. OD, 27, #365, 6/55, p. 366

27.3.7. Cranmer discusses recent Navy experience with Saran and vinyl coatings. Saran tank linings are reported to be in very good to excellent condition after being in service for periods ranging from 10 months to 20 months. Vinyl primers and vinyl antifouling paints are discussed. APJ, 39, #40, 6/20/55, p. 86

27.3.8. Seymour reviews coatings made from the furans. Includes chemistry of furfural and furfuryl alcohol, mechanisms of polymerization of furans, and applications. 77 references. OF, 16, #4, 4/55, p. 19

27.3.9. Vanstone discusses maintenance problems connected with tea plantations in India, and how paint can help. PI, 5, #1, 4/55, p. 43

27.3.10. Funke discussing new developments in protection of iron and steel against corrosion lists some of the more important general factors determining the rate of corrosion, reviews phosphating processes and synthetic resins. There is no universal method for protection of iron and steel against corrosion. PI, 5, #1, 4/55, p. 109

27.3.11. The limitations of the normal paint testing techniques for characterizing the cohesive properties of paint films are discussed by Elleman & May. Detached films are used to obtain the time-dependent behavior from curves of extension under constant load. A mechanical method is described of measuring the change of extension with time. The measurements have a variation of less than $\pm 5\%$. Methods of interpreting the creep curves of polymers using the concept of a distribution of retardation times are discussed. A discussion is given of the possible uses of a study of the time-dependent behavior in the greater understanding of the mechanism of film breakdown. JOCCA, 37, #413, 11/54, p. 595

27.3.12. Temperatures of at least 600° C were withstood by an aluminum pigmented butyl titanate paint, and a zinc dust pigmented paint made from butyl titanate polymer was found to protect steel from rusting under severe corrosive conditions. However, these materials had a number of disadvantages and Cox and Winter describe the improvements resulting from further investigations. A number of trials and special applications are described and typical formulations are given. PM, 25, #4, 4/55, p. 146

27.3.13. The anti-corrosive value of paints was discussed at corrosion group symposium. Papers included:

Paint Steel Structures
Exposure Tests
The Influence of Paint Constituents on the Protective Qualities of Paint
The Formulation of Priming Paints
Principles of Protective Painting
Physical Testing and Practical Performance
Good Painting Practice

PM, 25, #5, 5/55, p. 189

27.3.14. Christ describes the use of epoxy coatings to protect copper and brass. Specific applications are discussed as for pen caps, builders' hardware, and coffee-makers. OF, 16, #8, 8/55, p. 13

27.3.15. Schleicher continues his series on protection of steel. Part IV deals with zinc dust for primer coats. Part V deals with graphite. PIM, 69, #10, 10/54, p. 19

27.3.16. Gehant reviews the problem of corrosion and the role of protective coatings in reducing it. PIM, 70, #8, 8/55, p. 12

27.3.17. A liquid coating composition adapted for direct application to sheet steel in the manufacture of containers and closures therefor consisting essentially of a resinous composition dissolved in a volatile organic solvent, said resinous composition being composed essentially of two resins, resin A and resin B, and from 5 to 20% by weight of orthophosphoric acid based on the total weight of said resins, resin A being a polyepoxide polyglycidyl ether of bisphenol having a molecular weight of 1500 to 7200, and resin B being an alkali catalyzed condensation product of formaldehyde and a phenol reactant of the group consisting of 2,3 dialkyl phenol, 2,5 dialkyl phenol, 3,4 dialkyl phenol, 3,5 dialkyl phenol, 2 monoalkyl phenol, 4 monoalkyl phenol, and mixtures thereof, where the alkyl group has from one to five carbon atoms, condensed to the organic solvent-soluble condition, the proportion by weight of resin A to resin B varying from 50% resin A and 50% resin B to 80% resin A and 20% resin B, and the proportion by weight of said resinous composition in said liquid coating composition varying from 25 to 40%. USP 2,699,413

27.3.18. The method of treating a metal structure which comprises forming thereon a film of polyperfluorobutadiene and treating the film in situ with fluorine to produce an adherent coating resistant to corrosion by halogens and metal halides. USP 2,711,972

27.3.19. Gehant reviews corrosion and the protection of metals. Two basic methods are used to control corrosion of metals. The first is the metallurgical approach where the metal is alloyed to achieve desired corrosion resistance such as in forming stainless steel. The other is by use of a protective coating, either as a metallic coating such as galvanizing or plating, a ceramic coating, or an organic coating (painting). This article expands upon the painting approach. APJ, 39, #10, 11/22/54, p. 71

27.3.20. Greenburg & Jacobs discussing the corrosion aspects of air pollution cover: atmospheres, corrosive agents, oxygen and oxidants, acidic materials, salts, alkalies, materials affected, metals building materials, textile materials, leather, rubber, protective coatings, effect of weather, and bacterial deterioration. APJ, 39, #43, 7/11/55, p. 64

cf:
1.2.6
1.2.15
11.1.3
13.3.1
18.4.2
21.2.3
27.1.8
27.2.1
37.9.3
38.1.5

27.4.1. Glaser, at al, review various epoxy compositions useful in

the metal decorating industry. Classes of epoxy materials useful in metal decorating are presented. Resistance properties of epoxy-phenolic coatings are presented. Also included are resistance properties of epoxy-urea and/or melamine coatings, abrasion resistance properties of various white coatings, good properties of epoxy-ester roller coatings, and actual and projected uses of epoxy-ester coatings in the metal decoating industry. OD, 27, #360, 1/55, p. 3

27.4.2. Johnson describes how the finishing of bottle caps, toys, etc. is simplified by applying the coatings before the metal is formed. CPVM, 28, #9, 9/54, p. 32

27.4.3. The stringent requirements for lacquers used to protect tinplate, formed into metal containers for food and other products are outlined by Allsebrook. Each case has to be considered in relation to the material to be packed and the kind of decorative finish desired. Particular attention is given to the consideration of the problems of coatings for collapsible tubes. PM, 24, #11, 11/54, p. 384

cf:
27.7.5
37.9.3

27.5.1. Larson discusses organosols and plastisols—coatings made from vinyl dispersion resin. Viscosity—composition diagrams are presented for a number of organosol compositions. A diagram is included comparing plasticizers in organosols. Various formulations are discussed. Plasticizers in plastisols are compared. APJ, 39, #12, 12/6/54, p. 64

27.5.2. Severs & Austin describe methods and equipment used by themselves to clarify the problem of defining the flow characteristics of non-Newtonian materials, in the form of vinyl chloride resin plastisols. Flow curves obtained using an extrusion rheometer correlated with flow curves obtained from a modified Martinson coater. Dilatancy of the resin dispersion appeared to be important only when most of the fluid film thickness was involved.

The effect of a number of plasticizers on the flow properties of plastisols was investigated and the effects of chemical structure of plasticizers are discussed. The general question of the flow produced by mixtures of plasticizers is discussed. The concentration of the plasticizer is shown to have a more pronounced effect on the flow properties of highly solvated plastisols than on normal plastisols. IEC, 46, #11, 11/54, p. 2369

27.5.3. Darby & Graham studied the viscosity stability of plastisols. Evidence is presented to show that diisodecyl adipate and diisodecyl phthalate can be very useful for imparting low viscosity and excellent shelf-life to vinyl plastisols. It is also indicated that DIDP can be advantageously mixed with other plasticizers for imparting special properties. MP, 32, #10, 6/55, p. 148

27.5.4. Merrill describes the use of plastisols for coating applications. As vinyl plastisol dispersion coatings grow more versatile, they fulfill a wider range of protective coating requirements. MM, 42, #2, 8/55, p. 100

27.5.5. Zweig describes the rotational molding of plastisols. Specific details are presented which permit intelligent evaluation of the process and that are necessary for efficient operation. MP, 33, #1, 9/55, p. 123

cf:
18.4.2
18.7.1

27.6.1. Gerson reviews new paints for new automobiles. A forecast of changes in the industry includes:

a. an increased use of water emulsion materials
b. the increased use of epoxy undercoats
c. the alkyd based primer will increase in use
d. the continuing use of nitrocellulose and alkyd enamels as topcoats modified to produce better chip resistance, higher gloss and lower curing schedules. APJ, 39, #18, 1/17/55, p. 54

27.6.2. Elliott reviews the development of automotive touch-up paint. PF, 19, #10, 7/55, p. 50

cf:
1.2.16

27.7.1. Campbell reports that three different colors in a single application is possible with "multicolor lacquers"—a new product finish that is attractive, durable and can be sprayed on 5 mils thick. A multicolor lacquer is two or more nitrocellulose lacquers suspended in water and stabilized to prevent blending of the different-colored particles. The particles remain separate during application and drying, and they are large enough to form a distinct color pattern. Advantages, uses, and application are discussed. MM, 40, #5, 11/54, p. 86

27.7.2. Pickett, reviewing recent progress in lacquer finishes, discusses hot spray, glossiness, primers, pinholing, architectural lacquers, aerosols, specialty lacquers, methods of applying lacquers, and fields of application. OF, 16, #3, 3/55, p.8

27.7.3. Shreeve describes the use of lacquers containing insecticides for the control of insect pests, their composition, application and use, together with a short history of their development. The scope for the employment of this material for the hygienic protection of surfaces and similar purposes seems to be considerable. PM, 24, #10, 10/54, p. 349

27.7.4. Daggett studied the formulation of high-flash lacquers and thinners. Solvent power considerations, anomolous flash-points of mixtures, high-flash nitrocellulose lacquer, cellulose ether and alkyd finishes, and "to stir or not to stir" are considered. PT, 19, #211, 4/55, p. 131

27.7.5. Bruxelles & Mahlman discuss the relative effects of several variables on the unrubbed glossiness of lacquer coatings as a guide to predicting the level of glossiness achievable under production line conditions. Acceptable levels of unrubbed glossiness can be achieved through control of substrate roughness, primer formulation, and lacquer topcoat formulation. PVP, 45, #10, 9/55,

27.7.6. Daggett discusses the stability of cellulose bronze lacquers. Bronze powders have a tendency to cause many media to turn green. They also cause gelation. Various vehicles are discussed including nitro cellulose, ethyl cellulose, and cellulose acetobutyrate. PT, 19, #216, 9/55, p. 299

cf:
13.3.1
22.1.7
22.4.3
27.4.3
27.10.1

37.3.5
38.7.8

27.8. (No abstracts)

cf:
13.3.1

27.9. (No abstracts)

cf:
13.3.1

27.10.1. Kooistra and Sikkens review the cold check test and performance of furniture lacquers. After an introduction on the properties of furniture lacquers the origin and the fundamental principles of the cold check test are discussed. A theory on the mechanism of the formulation of cracks in wood lacquers is developed, and its agreement with the results of practical cold check tests is demonstrated. The influence of different variables such as film thickness and kind of wood has been investigated. Finally the practical value of the cold check test if fully discussed. PVP, 45, #3, 3/55, p. 36

27.10.2. Wampler reviews lacquer troubles on wood. He discusses what causes and how to prevent pinholes, blistering, pitting, pock marks, orange peel effect, blushing, printing, slow drying, poor adhesion, and surface cracking. IF, 31, #3, 1/55, p. 70

cf:
26.4.4

27.11.1. Robinson discusses printing inks in India. Printing inks in India suffer from a domestic source of pigments but in time an Indian organic color making industry will develop and mature. However, this prospect is well beyond the horizon. PI, 4, #1, 4/54, p. 99

27.11.2. Liberty presents a discussion of experimental techniques aimed at further improvement in printing procedures. A major handicap to thorough drying of inks on polyethylene is that the film will not absorb any of the ink or allow appreciable amounts of solvents present in the ink to pass through it and evaporate into the air. For ink to dry on polyethylene the surface must not crust over, so that the solvent can evaporate through the surface of ink. MP, 32, #2, 10/54, p. 137

27.11.3. The use of the G. I. T. Printability Tester is described, by Dharap, with emphasis on the precautions to be observed to get precise results under prevailing conditions of temperatures and humidity. PI, 5, #1, 4/55, p. 82

27.11.4. Coupe discusses the influence of paper on the autoxidative drying of printing inks.

The rate of drying of printing inks on paper falls as the acidity of the paper rises, the effect being more marked at higher ambient humidity. It is primarily due to the irreversible sorption of cobalt (probably as the ion) on the cellulose fibers.

Troubles are more often experienced in lithography than in letterpress printing, owing to the larger amount of water, the smaller amount of cobalt, and the thinner films customary with the former process. Addition of cobalt nitrate to the ink or to the fountain solution may afford a remedy. JOCCA, 37, #413, 11/54, p. 621

27.11.5. Soane reviews the difficulties experienced in obtaining a blue tone when using carbon black manufactured from petroleum products and discusses other aspects of the manufacture of newspaper inks. The development of these products is also outlined and the range of mills now available for the dispersion process indicated, together with a survey of the tests applied to control the production of this type of ink. PM, 24, #10, 10/54, p. 341

27.11.6. Williams discusses the mechanism of film formation in high-speed rotary printing, the apparatus used to study the process, and the information on ink misting resulting from work being undertaken in the author's laboratory. PM, 25, #2, 2/55, p. 59

27.11.7. Bowles reviews the status of ink in the printing industry. PT, 18, #207, 12/54, p. 129

cf:
34.3.6

27.12.1. The practical requirements for linseed oil putty, and previous studies on the subject, are reviewed by Bessey and Lammiman. Consideration is given to the proportion of whiting and oil, and the properties of the oil and whiting, necessary for making good putty. The relations between composition, mixing conditions and properties of the putty, as deduced from experimental work, are discussed with some theoretical consideration of the mechanism of the changes occurring during mixing. The rheological properties of the whiting-oil mixes are considered in their relation to the practical properties of putty as judged subjectively by the putty-maker and glazier. A brief description is given of existing methods of testing putty and of methods devised by the authors for determining "length" and "strength" of putty, and oil separation from it on storage. JOCCA, 37, #412, 10/54, p. 562

27.12.2. A description is given, by Bessey & Lammiman, of an extensometer for measuring the "tensile strength" and "extension at break" of putty and similar materials. This instrument, the design of which is based upon work done with a more flexible research apparatus, is intended for routine testing work and gives results which define closely the characteristics of glazing putty. JOCCA, 38, #2, 2/55, p. 92

27.12.3. Acaster found that replacement with lanolin of about half the linseed oil content of putty gives a product of improved storage stability and durability. A slight change in manufacturing technique is required, and the product is rather harder to handle in cold weather. JOCCA, 38, #7, 7/55, p. 359

27.12.4. Bowen discusses the role of calking in satisfactory paint jobs. He reviews the standards calks should meet, and how the condition of the surface is an important factor. PL, 27, #3, 3/55, p. 16

cf:
23.1.13
34.2.2

27.13.1. Black & Blomquist report results of current studies at the Forest Products Laboratory to develop a metal-bonding adhesive with greater resistance to temperatures up to 600°F. that is easier to use than present ones. Most promising is a formulation of phenol and epoxy resins modified with hexamethylenetetramine supplied for use as dry tape supported on glass-mat base. MP, 32, #4, 12/54, p. 139

27.13.2. Thielsch describes adhesive bonding in 16-page Materials & Methods Manual No.

110. There are at least 24 different types of structural adhesives in use today. Each type can be altered to meet different end-use or fabrication requirements. Most types can be made available in several different forms. The result is a variety that can be confusing to the uninitiated. This manual takes you behind the meaningless array of tradenames, numbers and chemical labels. It tells what types of structural adhesives are available, how their properties can be altered, in what forms they are available, for what bonding methods they are suitable, who makes them, and for what applications they are recommended. It also tells you how to go about selecting the right adhesive for a specific application. MM, 40, #5, 11/54, p. 113

27.13.3. Epstein discusses two new heat resistant adhesives developed for metal bonding by North American. These adhesives are suitable for structural applications at temperatures as high as 600°F. The first, "NAA Hi-Temp," is especially suitable for metal-to-metal adhesive bonding. The second, "CHT," is a modification designed for the fabrication of heat resistant sandwich constructions. MM, 41, #1, 1/55, p. 107

27.13.4. Schwartz and Wittman studied adhesive bonded metal joints. Measurements of room temperature shear strength on adhesive-bonded lap joints show that rates of loading from static to impact speeds have no effect on strength. Eight different adhesives were evaluated, ranging from rigid resin-type to less rigid rubber-resin plastic compounds. PE, 26, #7, 7/55, p. 170

27.14.1. Gibson reviews protective coatings for electrical connections. For copper or aluminum connectors used on industrial equipment, low cost coatings prevent formation of high-resistance surface films, aid in maintaining low-resistance connections and preventing discoloration. PE, 26, #4, 4/55, p. 156

27.14.2. Mahon discusses insulating materials and their functional evaluation. The author discusses the functional link between electrical insulation and surface coating applications, presents an insulation classification, the functional testing of electrical insulation, including the "motorette" test. OD, 27, #365, 6/55, p. 354

27.14.3. Researchers are taking an entirely new approach on design, testing and application of electrical insulation materials. Mahon describes new ideas on insulation coatings, formulation, tests, etc. CPVM, 29, #6, 6/55, p. 10

cf:
14.1.2
16.1.8

27.15.1. Hancock discusses plasticized sulfur compositions for traffic marking. Ever increasing motor traffic creates the continuing problem of better materials for traffic marking to promote safer driving.

A promising new type of material is indicated from studies of the performance of sulfur compositions containing 5 to 15% of Thiokol Type A, 1 to 3% of a Hansa Yellow type pigment, and 0.5% of a bactericide. Incorporation of glass beads increases night visibility and effective life. Recent tests indicate that about 2% of wood rosin is significantly beneficial. Performance is about the same on both concrete and asphalt pavements. The setting-up time in minutes required before opening to traffic is very roughly equal to the percentage of thiokol.

Wider knowledge and more extensive tests of such plasticized sulfur compounds may lead to acceptance as serviceable traffic marking material. IEC, 46, #11, 11/54, p. 2431

27.15.2. Cody describes how the State of Washington tackled the traffic paint problem. Equipment and tests are discussed. Washington State Highway Commission Specifications for Traffic Line Paint is included. OD, 27, #367, 8/55, p. 551

27.15.3. Baumann & Diefenderfer discuss a laboratory method of test for no-dirt-retention time of traffic paints. ASTM, #208, 9/55, p. 32

27.16.1. Parks reviews the painting of plastics. Methods of applying paint include spraying, silk screening, dipping, printing, roller coating, and brushing. This article is essentially concerned with spray and silk screen formulations plus a discussion of finishes used in connection with vacuum metalizing of plastics. Scope of treatment includes resin-solvent systems, resins dispersed in non-solvents, liquid oils and liquid resins, and hot melt systems. The resin system, the solvent system, the pigments, problems in operation, and summary are presented. MP, 32, #9, 5/55, p. 99

27.16.2. In Materials & Methods Manual No. 166, Campbell describes the paint, ink, metallic and other coatings used in plastics. The manual tells what types of finishes are available, how they can be applied, what advantages they offer, and what limitations must be considered. It also tells what types of finishes should be considered in trying to achieve specific functional advantages or decorative effects. MM, 41, #6, 6/55, p. 119

27.16.3. A process for the production of well-adhering coatings on the surface of polyethylene articles which comprises applying thereto a solution containing a member of the group consisting of polyvinyl chloride and an interpolymer of a major proportion of vinyl chloride with a minor proportion of a member of the group consisting of vinyl esters, and a plasticized alkyd resin and drying the applied coating. USP 2,689,197

27.17.1. The Paint Oil & Chemical Review presents part I of a 4-part review of the technology of paper coating. This first part includes:

I Introduction
II What will coatings do for paper?
  A. Moisture Vapor Resistance
  B. Water Resistance
  C. Grease Resistance
  D. Alkali Resistance
  E. Acid Resistance
  F. Solvent & chemical Resistance
  G. Abrasion Resistance and Related Properties
  H. Gas Resistance
  I. Heat Sealing
III Methods of Applying Coatings to Paper
  A. Physical form of the Coating
  B. Machines for Coating Paper
    1. Sheet Coating
    2. Web Coating
    3. Print Roll Coating
  C. Drying Systems

POCR, 118, #7, 4/7/55, p. 12.

27.17.2. Part II of the 4-part review of the technology of paper coating includes:

IV Inorganic Coatings for Paper
- A. Coating Pigments
- B. Coating Adhesives

V Organic Coatings for Paper
- A. Waxes
- B. Water Soluble Organic Coatings
  1. Polyvinyl Alcohol
  2. Methyl Cellulose
  3. Sodium Carboxymethylcellulose
  4. Sodium Alginate

POCR, 118, #8, 4/21/55, p. 16

27.17.3. Part III of a staff report on the technology of paper coating includes:

- C. Spirit Varnish Coatings
  1. Natural Resins
  2. Zein
- D. Nitrocellulose Coatings
- E. Cellulose Acetate and Related Esters
- F. Cellulose Ethers
- G. Polyvinyl Acetate and Polyvinyl Chloride
  1. Polyvinyl Acetate
  2. Polyvinyl Chloride
  3. Polyvinyl Acetate—Polyvinyl Chloride Copolymers.

POCR, 118, #9, 5/5/55, p. 22

27.17.4. Part IV of a staff report on the technology of paper coatings includes:

- H. Other Vinyl Type Coatings
  1. Polyvinyl Acetate
  2. Polyvinylidene Chloride
  3. Polyethylene
  4. Polystyrene
  5. Acrylic Resins
- I. Rubber and Rubber Derivatives
  1. Cyclized Rubber
  2. Chlorinated Rubber
  3. Polybutenes
  4. Neoprene
  5. Other Synthetic Resins
- J. Polyamide Resins
- K. Miscellaneous Resins
  1. Polyesters
  2. Phenolic Resins
  3. Urea and Melamine Resins
  4. Silicone Resins
  5. Quilon
  6. Sulfanamide-Formaldehyde Resins
  7. Asphalts
  8. Oleoresinous Varnishes

POCR, 118, #10, 5/10/55, p. 16

27.18.1. Johnson discusses the problem of change of mildew strains due to the use of fungicide in the paints. Growth of mercury tolerant mildew strains force mildew inhibitive paint manufacturers to change methods. CPVM, 29, #4, 4/55, p. 18

27.18.2. The more common wood-attacking insects are described, by Edwards, and measures to prevent attack outlined A description is given of the fungi which destroy timber, and the conditions favoring their activity. The testing of preservative solutions is considered, with particular reference to the laboratory method using pure cultures. The properties needed for an ideal wood preservative are examined and compared with the performance of some of the currently used materials. JOCCA, 37, #414, 12/54, p. 655

27.18.3. "Is paint mildew fighting back?" asks Johnson. In this article, the author reviews mildew resistant paints and discusses how the formerly effective paints are losing their potency. Mildew strains are changing and adapting themselves to the fungicides so that they (fungicides) are no longer effective. APJ, 40, #1, 9/19/55, p. 80

---

cf:
24.3.2
27.1.9

27.19.1. Grupp reports on U. S. Navy program on development of shipbottom coatings. OF, 16, #2, 2/55, p. 22

27.19.2. Alexander reviews recent developments in antifouling paints. He discusses: the need for antifouling paints, classification and properties of antifouling paints, the application of antifouling paints, antifouling paints and cathodic protection, and summary. OF, 16, #9, 9/55, p. 5

cf:
27.3.7

27.20.1. Conrad, reviewing wrinkle finishes, discusses types of wrinkle finishes, blends and modifications, methods of application, air-drying, baking, and latest developments. OF, 16, #3, 3/55, p. 11

27.21.1. The method of decorating a substantially non-porous surface to provide segregated raised areas of color super-imposed upon a background color thereby imparting color to the areas between said segregated raised areas which comprises the steps of coating said surface with an oleoresinous base coating composition characterized in that it remains tacky for a period from about 1 to about 8 hours, and during the time which said oleoresinous base varnish remains tacky, re-coating said surface with a latex water emulsion paint as a continuous wet film of non-uniform thickness by using a coating applying means which deposits the coating on direct contact of said means with said surface, and allowing the plural coated surface to dry. USP 2,714,560

CHAPTER 28

EMULSION COATINGS

28.1.1. A panel discussion on "Polyvinyl Acetate Emulsion Paint Systems" was presented at the Federation's 32nd Annual Meeting in Chicago, Nov. 20, 1954. The papers included:

Introduction
—H. A. McConaghie
Vinyl Acetate Copolymers and Externally Plasticized Polyvinyl Acetate in Water-Base Paints
—N. G. Tompkins
A Mechanism of Film Formation of Polyvinyl Acetate Emulsions
—O. L. Wheeler, H. F. Joffe & N. Wellman
The Formulation of Polyvinyl Acetates Paints
—J. W. Gallagher
Colored Pigments for Polyvinyl Acetate Paint Systems
—L. R. Sherman
Performance of Polyvinyl Acetate Emulsion Paints in Interior Exposures
—M. C. Londergan

OD, 26, #359, 12/54, p. 1233

28.1.2. A preliminary report from the Hercules Powder Company reveals recent work on resin dispersions which gives promise of lowering latex paint prices and in some instances improving film properties of these paints. POCR, 118, #2, 1/27/55, p. 16

28.1.3. Beardsley discusses polyvinyl acetate emulsion-base paints, their formulation and properties as primer-sealers, interior topcoats and exterior coatings. It is now possible to formulate high quality primer-sealer, interior topcoat, and exterior masonry paints with polyvinyl acetate emulsion. Exterior durability of these paints on wood is promising although additional testing is required before specific recommendations can be made. Further testing is also required to confirm the durability of recently developed formulations on weathered oil paints. OD, 27, #363, 4/55, p. 205

28.1.4. Water-thinned paints are here to stay, now that newer, better emulsions are available to further excite a public fancy first caught by rubber latex. CE, 62, #7, 7/55, p. 140

28.1.5. Dyer examines plastic emulsion paints for their advantages and disadvantages under Indian conditions. PI, 4, #9, 12/54, p. 67

28.1.6. Singer presents Chapter XVI of "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter deals with emulsion and water thinnable paints. APJ, 39, #42, 7/4/55, p. 64

28.1.7. The complex nature of the viscosity characteristics of an emulsion-paint system is discussed by Woodbridge, and viscosity and thixotropy measurements before and after ageing described. Artificial ageing is obtained by incubation at 40°C for one week, or by high-speed mixing of a sample for one hour. Resistance to water and humid conditions is assessed by means of a steam cabinet, scrub-resistance tests and a simple "watch-glass" test. The determination of permeability of unpigmented and pigmented emulsions is described and the effect of plasticizer content, pigment/binder ratio and type of extender is shown. The necessity, initially, for long-term tests and field trials under normal exposure conditions is emphasized, and mention is made of the difficulty in finding a satisfactory substrate for exposure testing. JOCCA, 38, #6, 6/55, p. 285

28.1.8. Singer presents part I of Chapter XVII of his course "Fundamentals of Paint, Varnish, and Lacquer Technology" dealing with "Latex Type" of water thinnable paints. APJ, 39, #45, 7/25/55, p. 70

28.1.9. Heiberger presents part I of a series of articles discussing basic concepts in latex paint formulation. APJ, 39, #47, 8/8/55, p. 64

28.1.10. Heiberger continues his series on basic concepts in latex paint formulation. APJ, 39, #49, 8/22/55, p. 62

28.1.11. Heiberger, in part III of his article on basic concepts in latex paint formulation discusses:

viscosity control
techniques in monomer additions
equipment
influence of physical properties of latices on paints

APJ, 39, #50, 8/29/55, p. 58

28.1.12. Rudram summarizes work done to study the structural properties of synthetic resin emulsion paints. Electron microscopy of film surfaces and of film sections is discussed. PT, 19, #215, 8/55, p. 265

28.1.13. Heiberger in this fourth and concluding part of "Basic Concepts in Latex Paint Formulation" includes the following: stability, compatibility, the role of additives in latex paint, preservatives, thickeners, antifoamers, freeze-thaw stabilizers, emulsifiers, buffers, plasticizers, anti-rust agents, and pigments dispersants. APJ, 39, #51, 9/5/55, p. 63

28.1.14. Singer continues Chapter XVII of "Fundamentals of Paint, Varnish and Lacquer Technology." This chapter deals with latex type water thinnable paints. APJ, 39, #52, 9/12/55, p. 40

28.1.15. Latex paint, after only five years has captured over 7% of the paint industry's total sales. CEN, 32, #42, 10/18/54, p. 4162

28.1.16. Singer presents part III of Chapter XVII of "Fundamentals of Paint, Varnish, and Lacquer Technology." This chapter deals with latex type of water thinnable paints. APJ, 40, #1, 9/19/55, p. 68

28.1.17. Singer continues Chapter XVII of "Fundamentals of Paint, Varnish and Lacquer Technology". This chapter deals with latex type water thinnable paints. APJ, 40, #2, 9/26/55, p. 76

28.1.18. As a new composition of matter, a synthetic rubber latex base water emulsion paint containing from about 0.05 to 1% volume of a defoaming agent consisting of an alcohol selected from the group consisting of tetramethylolcyclohexanol, penaterythritol, dipentaerythritol and tripentaerythritol esterified only with an acid selected from the group consisting of alkanoic and alkenoic monocarboxylic fatty acids having from two to eighteen carbon atoms and mixtures thereof. USP 2,686,-766

28.1.19. A water paint comprising a synthetic latex and an enzyme-digested protein stabilizer selected from the group consisting of enzyme-digested milk casein and soya protein and prepared by dispersing an isolated protein selected from the group consisting of milk casein and soya protein in water to form a dispersion with the aid of an alkaline substance in an amount to bring the pH to within the range from about 6 to about 8.5, adding a proteolytic enzyme which is active at a pH within that range and is capable of digesting milk casein or soya protein to a stage having calcium ion compatibility, and allowing the enzyme to digest the protein until there is produced a digested protein having bivalent metal ion compatibility as measured by the calcium sulfate test, while retaining good bonding and emulsifying power. USP 2,687,384

28.1.20. A low-viscosity aqueous dispersion consisting essentially of a hard natural wax selected from the class consisting of carnauba wax, ouricury wax and candelilla wax, and a wax-immiscible resin produced by emulsion polymerization selected from the class consisting of polymethacrylic acid, polystyrene and copolymer of vinyl acetate and methacrylic acid, substantially all the wax particles and substantially all the wax-immiscible resin particles present in the aqueous dispersion being of the same average diameter and less than 1 micron. USP 2,695,277

28.1.21. A composition of matter comprising (1) a water-base paint selected from the class consisting of water-base casein paints, water-base rubber paints, and water-base oil-modified alkyd resin paints, and (2) from 0.1 to 7 per cent, by weight, based on the weight of the solids content of the aforesaid water-base paint, of a water-soluble alkali-metal salt of a hydrocarbon-substituted silane triol. USP 2,713,545

cf:
1.2.15
1.2.18
19.4.1
19.4.6
19.4.7
21.5.2
24.8.1
25.7.1
26.4.5
34.3.10
34.4.2
37.3.7
37.10.1

28.2.1. In a report by the editorial staff of Paint and Varnish Production on preliminary outdoor exposure, exterior paints based on acrylic emulsion. Many outdoor tests are needed to establish durability of exterior coatings. In this review, properties of acrylic emulsion, preparation, dispersants, viscosity control agents, preservatives, other additives, pigmentation, application, exterior performance, and factors affecting performance are discussed. PVP, 44, #10, 10/54, p. 23

28.2.2. The Bakelite Corporation issued 8-page Release #10 describing exterior exposure of vinyl acetate latex paints.

cf:
19.1.2
28.1.3

28.3.1. Sullivan discusses interior wall paints based on vinyl acetate resin latex. Film properties of vinyl acetate resin latex, plasticization, scrub resistance, pigmentation, modifiers, and formulation are discussed. Formula suggestions are presented for plaster and wallboard sealer, green interior wall paint, and for white interior wall paint. PVP, 44, #12, 12/54, p. 23

cf:
19.1.2
28.1.3

CHAPTER 29

SURFACE PREPARATION

29.1.1. Cook, et al, describe electrolytic descaling, an electrical method of rust removal used to remove rust from tanker ship compartments. Following an introduction and discussion, detailed laboratory investigations and actual field testing is described. C, 11, #4, 4/55, p. 31

29.1.2. Greenwood discusses the preparation of surfaces for painting. CE, 62, #5, 5/55, p. 214

29.1.3. Johnson describes first steps in finishing. This included cleaning, derusting, and pre-treatment and priming such as etch priming. PI, 4, #9, 12/54, p. 25

29.1.4. Baer discusses cold solvent degreasing. A properly blended cold degreasing solvent is highly stabilized permitting the user to degrease many kinds of metals and alloys without the fear of etching. It lends itself to large and small industries alike, offering cleaner performance, economy, versatility, and safety. OF, 16, #6, 6/55, p. 18

29.1.5. Close describes how pretreatment improves finish quality. PF, 19, #7, 4/55, p. 44

29.1.6. Bardin discusses the role of abrasives in surface preparation. IF, 31, #6. 4/55, p. 44

29.1.7. Wernick and Pinner discuss chemical conversion coatings in part V of the series on the surface treatment and finishing of light metals. MF, 52, #10, 10/54, p. 68

29.1.8. Wernick and Pinner continue their discussion of Chemical conversion coatings in part V of the series on the surface treatment and finishing of light metals. MF, 52, #11, 11/54, p. 83

29.1.9. Pocock presents a survey of Chromate treatments for metals. Following an introduction, he discusses the nature of chromate coatings, historical background, method of applying chromate coatings, both composition and control, and general properties of chromate films. MF, 52, #12, 12/54, p. 48

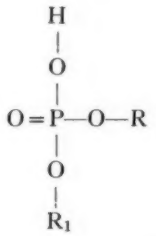
29.1.10. Pocock continues his survey of chromate treatments for metals. Treatments for zinc, codmium, aluminum, and magnesium are discussed. MF, 53, #1, 1/55, p. 80

29.1.11. Morris discusses metal cleaning with ultrasonics. Ultrasonic cleaning new promises to revolutionize the technology of removing oil, dirt, grease, and chips from metal parts. MF, 53, #2, 2/55, p. 63

29.1.12. Wernick and Pinner continue their discussion of chemical conversion coatings in part II of part V of the series on the surface treatment and finishing of light metals. MF, 53, #2, 2/55, p. 66

29.1.13. Wernick and Pinner continue their discussion of chemical conversion coatings in part III of part V of the series on the surface treatment and finishing of light metals. MF, 53, #3, 3/55, p. 73

29.1.14. A chemical composition for the primary treatment of the surfaces of metals of the group consisting of steel, zinc and aluminum consisting essentially of 2%-16% basic zinc chromate; 2%-16% of at least one resin selected from the group consisting of polyvinyl butyral, alkyd resins and polyamide resins, a suitable solvent therefor and 2%-20% of phosphate of the following structure:



wherein R is selected from the group of radicals consisting of hydrogen, ammonium and substituted ammonium and R_1 is selected from the group consisting of ammonium and substituted ammonium, the pH of said composition being from 6 to 9.

The method of forming a relatively thin coating as a paint base on a metal of the group consisting of steel, zinc and aluminum, said method comprising the steps of contacting the surface of said metal with 2%-16% basic zinc chromate, 2%-16% of at least one resin selected from the group consisting of polyvinyl butyral, alkyd resins and polyamide resins, a suitable solvent for said resin and 2%-20% of a phosphate selected from the group consisting of diammonium phosphate, guanylurea phosphate, dimorpholine phosphate, ditrimethyl ammonium phosphate, said composition having a pH between 6 and 9, to form a film having a thickness between 0.1 and 0.8 mil by reaction between the said base metal and the said composition, and subsequently drying the reaction product film. USP 2,692,840

29.1.15. An aqueous metal treating bath consisting of water, chromic acid, and cerium nitrate, said chromic aicd being present in an amount of from 0.04 to 12 grams per liter and the cerium nitrate being present in an amount of from 0.02 to 6 grams per liter. USP 2,698,266

29.1.16. A composition suitable for use in cloth-buffing of lacquered furniture, that consists essentially of (*a*) 3-5 parts of a rubbing compound of 16.5 weight per cent aqueous alkali metal soap of fatty acids of 60 weight per cent solids content, 45.5 weight per cent tripoli, 21.5 weight per cent kerosene and 16.5 weight per cent water; (*b*) 3 parts of a soap composition of 36 weight per cent aqueous alkali metal soap of fatty acids of 40 weight per cent solids content, 1 weight per cent pine oil and 63 weight per cent water; and (*c*), as a diluent, 1-5 parts of water. USP 2,699,990

cf:
30.2.12
Manufacturers:
American Chemical Paint Company
Enthone, Inc.
Klem Chemicals, Inc.
Kosmos Electro-Finishing Research, Inc.
Mitchell-Bradford Chemical Company
Northwest Chemical Company
Oakite Products, Inc.
Pelron Corporation
Chas. Pfizer & Co., Inc.
Promat Division

29.2.1. Gentieu reviews phosphate finishes and preparation of metal surfaces for paint. Cleaning without surface conversion or modification, cleaning with surface modification, and cleaning with surface conversion are included. Description of phosphate finishes, properties of phosphate finishes, and phosphates used for industrial finishes are discussed. PE, 26, #4, 4/55, p. 190

29.2.2. Doss studied the effect of chromic and chromic-phosphoric acid rinse solutions on the durability of paint coatings. Painted panels which were first rinsed in the 30 oz CrO_3/100 gallon or the 16 oz CrO_3 plus 16 oz H_3PO_4/100 gallon had the least corrosion products or paint blistering when subjected to salt spray. It indicates that the more concentrated rinse solutions offered better protection for the painted panels. Also, the residues of these rinses do not lead to objectional paint blistering and shedding. Therefore the more concentrated rinse solutions should be used for phosphate coatings that are to be subsequently painted.

The panels which were rinsed in the 32 oz H_3PO_4/100 gallon rinse at room temperature exhibited a considerable amount of corrosion resistance in the water immersion test, but, in the salt spray test, the phosphoric acid rinsed panels had the most corrosion products and paint flaking. This could be attributed to the phosphoric acid rinse leaving acid residues which in the presence of salt spray vapors increases the corrosion of the painted panels. Another observation noted was that panels rinsed in the various rinses at room temperature were equivalent to those rinsed at 165°F. OF, 16, 6/55, p. 7

29.2.3. Wise reviews the pretreatment of ferrous surfaces prior to painting. The preparation of a metal surface on which paint or enamel is to be applied is a vital factor in the life and service of the coating. Phosphate pre-treatment is discussed in the article. PF, 19, #3, 12/54, p. 36

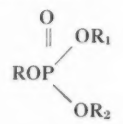
29.2.4. Stockbower discusses chemical coatings applied to metals prior to painting. PF, 19, #4, 1/55, p. 24

Manufacturers:
American Chemical Paint Company
Cowles Chemical Company
Detrex Corporation
Klem Chemicals, Inc.
Metalwash Machinery Corporation
Neilson Chemical Company
Oakite Products, Inc.
Parker Rust Proof Company
Pelron Corporation
Pennsylvania Salt Mfg. Company
Promat Division

29.3.1. Truden discusses paint stripping and methods used at the Crosley-Bendix Home Appliance plant at Nashville (Tenn.). IF, 31, #10, 8/55, p. 22

29.3.2. The method of removing paint from a painted object which comprises immersing said object in a body of cold liquid paint solvent, spraying the object with cold liquid paint solvent in a spraying zone, passing the sprayed object into a second liquid body of cold paint solvent, passing the object from said second body into a vapor zone, contacting said object with heated vaors of said solvent in said vapor zone to heat said object, and passing the heated object into a cooling zone to condense vapors from said vapor zone. USP 2,689,198

29.3.3. A process for the removal of paint varnish and lacquer films from surfaces bearing said films comprising applying to said surfaces a film softening amount of a substantially non-inflammable fluent alkyl diaryl phosphate ester having the formula



wherein R represents a radical selected from the group consisting of alkyl and alkoxyethyl radicals containing from 1 to 12 carbon atoms and R_1 and R_2 are each selected from the group consisting of phenyl and cresyl radicals, allowing said composition to remain on said surface until said film is loosened, and removing the loosened film. USP 2,704,278

29.3.4. The method of removing a dried organic film from a substrate comprising coating said film with a paint and varnish remover comprising a major amount of a normally liquid halogen-containing alkene of no more than 2 carbon atoms and having a boiling point less than about 100° C., and a minor amount of a cellulose derivative, after the old film has softened, overcoating the softened film with a second composition comprising in admixture a normally liquid hydrocarbon, an alcohol, and an ester of an aliphatic carboxylic acid and an alcohol, which ester contains from 3 to 5 carbon atoms, and then stripping the resulting softened and loosened old film from the substrate. USP 2,705,207

Manufacturers:
Corrosion Control Co., Inc.
The Dacar Chemical Products Company
The DuBois Co., Inc.
Enthone, Inc.
Klem Chemicals, Inc.
Northwest Chemical Company
Pelron Corporation
Pennsylvania Salt Mfg. Company

CHAPTER 30

APPLICATION METHODS AND EQUIPMENT

30.1.1. Ramanujam presents part II of "Developments in the Painting of Railway Rolling Stock." The author discusses finishing coats, synthetic paints, stoppers and fillers, abrasives, wet-or-dry abrasive papers, coach painting in the past, changes in coach painting practice, painting in railways, synthetic type finishes, american practice, wagons, tank cars, steam locomotives, and electric locomotives. PI, 3, #11, 2/54, p. 29

30.1.2. Ramanujam presents part III of "Developments in the Painting of Railway Rolling Stock." The author discusses painting schedules in England, the 12-day schedule, improved type of coaches, bituminous emulsion, details of surface preparation, freight stock, locomotives, front of tender, painting in India railways, exterior of body, interiors and locomotives. PI, 3, #12, 3/54, p. 25

30.1.3. Packman describes painting at the Port of New York Authority. In 1954 the Port Authority purchased:

18,000	gallons	grey-green and miscellaneous
25,000	"	red-lead paste
30,000	"	aluminum paste
15,000	"	varnish vehicle
2,000		paint brushes

APJ, 39, #25, 3/7/55, p. 30

30.1.4. Mansell describes how up-to-date conveyorized furniture finishing can increase production and cut costs in furniture finishing. CPVM, 28, #11, 11/54, p. 10

30.1.5. "What about application, Mr. Formulator?" asks Miller. A great deal of attention has been paid to the formulation of organic coatings, especially to the durability and suitability for the finished articles. However, the formulating chemist has, at that point, happily washed his hands of the whole business and told the manufacturer, "Here's the product, now put it on." The author outlines a number of application methods and suggest more cooperation from paint formulators. CPVM, 28, #11, 11/54, p. 15

30.1.6. Cook describes the finishing of transformers by flow coating and spray at the Canadian General Electric plant at Guelph, Ontario. Some units up to 30 ft. high are included in this super, large-scale finishing set-up. CPVM, 28, #12, 12/54, p. 18

30.1.7. Cooke describes the hand finishing of laminated speed boats. Industrial Shipping, Ltd., Mabone Bay, N. S. finds hand finishing necessary for quality finish on speed boats. CPVM, 29, #3, 3/55, p. 5

30.1.8. Dove discusses "why paint at all?" Serving as a general introduction to industrial finishing, this article deals with the subject in an elementary manner, to be of use to the general reader. PI, 4, #9, 12/54, p. 21

30.1.9. Nag reviews industrial finishing in India. PI, 4, #9, 12/54, p. 45

30.1.10. Bobalek, reviewing industrial finishing methods, discusses the following: quality specifications for the paint films, should the protection line be automatic?, chemical variables, evaporation processes, curing (or drying) of paint, influence of coating material on choice of painting method, spray painting; compressed air atomization, hot spraying, hot spraying with airless atomization, electrostatic spraying, special spray techniques, non-atomization paint application methods, dipping, flow coating, tumbling, roller coating, drying paint, box-types ovens, continuous conveyor ovens, infrared ovens, and miscellaneous methods of paint drying. OF, 15, #10, 10/54, p. 11

30.1.11. Hyler describes localized color filling and application. Methods include application of color to sunken engraved filigree, printing, etc. OF, 15, #12, 12/54, p. 7

30.1.12. Sternberg discusses how many coats of paint should be used for specific applications. Factors governing the number of coats of paint required are discussed. Paint system categories and examples are presented. Testing procedures are reviewed. OF, 15, #12, 12/54, p. 10

30.1.13. Montgomery describes the application of aircraft finishes at de Havilland Aircraft of Canada, Ltd., at Toronto. CPVM, 29, #5, 5/55, p. 16

30.1.14. Hyler discusses various approaches to automatic finishing. Part I includes: oven integral part of setup, special guns for automatic machines, work-following attachments used, other aspects of chain-on-edge machines, column pivoting and chain travel synchronized, using vertical transverse machines, and automatic contact or mask-type units. OF, 16, #2, 2/55, p. 15

30.1.15. Hyler, in part II of "Various Approaches to Automatic Finishing" discusses automatic electrostatic spraying and detearing, automatic flow-coating applications, and automatic pipe coating setups. OF, 16, #3, 3/55, p. 16

30.1.16. Baird discusses the finishing of automotive bodies at the Chrysler Corporation's Mack plant. OF, 16, #6, 6/55, p. 23

30.1.17. Rudolph describes the painting of military aircraft assemblies—wings, ailerons, flaps, spoil-

ers, center and outer panels, etc., at the Aircraft Division of Twin Coach Company, Buffalo. OF, 16, #7, 7/55, p. 9

30.1.18. McFee describes the cleaning and finishing practice for phosphated zinc-coated sheets. Basically it boils down to two key points—clean the surface thoroughly and use enamels or paints of good quality. OF, 16, #7, 7/55, p. 11

30.1.19. Chester discusses estimating the quantity of materials needed in finishing furniture. IF, 31, #3, 1/55, p. 60

30.1.20. Hinkley describes the finishing of wood turnings in a tumbling barrel. IF, 31, #6, 4/55, p. 56

cf: 1.2.28

30.2.1. Wright describes the hot spray application of vinyl paints, resulting in more build-up per coat, lower labor sagging, and reduced costs. How hot spraying of vinyls has helped Carbide & Carbon Chemicals Company in Texas City, Texas is discussed. Hot application, evaluation, field tests, and reviewed. PVP, 44, #10, 10/54, p. 30

30.2.2. Mukherjea presents the second part of his article on recent developments in spray-painting, in which he discusses electrostatic spraying and detearing. The author covers the following: electrostatic spraying, Ransburg Process 2, and electrostatic detearing process. PI, 4, #2, 5/54, p. 29

30.2.3. Johnson discusses making the most of the spray painting method. Included are discussion of equipment, material controls, air and fluid pressure controls, proper spray gun techniques, care and maintenance, what kind of surfaces and materials should be sprayed, adhesion and durability, use of heated materials in maintenance painting, and catalyst sprays. APJ, 39, #35, 5/16/55, p. 86

30.2.4. Quality finishing with speed is result of installing electrostatic spray in the Canadian General Electric Co., Ltd., small appliances plant in Barrie, Ontario. CPVM, 28, #8, 8/54, p. 4

30.2.5. Cook describes how the J. A. Wilson Lighting Co. (Toronto) broke their finishing bottleneck with electrostatic spray. CPVM, 28, #9, 9/54, p. 28

30.2.6. Johnson discusses how electroformed masks cut time in spray decoration. Specialty finishing of shaped surfaces has been greatly improved and cheaper electroforming processes. CPVM, 29, #2, 2/55, p. 6

30.2.7. Regular cleaning and checking of spray heads means difference between efficiency and haphazard operation. Before using spray gun on a job, test it to make sure spray pattern is right. Hardwood stick or fine stone pencil only should be used to remove burrs from air holes in air cap. When air cap is clogged with paint it should be placed in solvent to soak until paint is dissolved. The excessively clogged cap can be replaced with clean one. Spraying clear thinner through gun after using is good method of cleaning air cap and fluid tip. CPVM, 29, #2, 2/55, p. 14

30.2.8. Johnson discusses how the problems in finishing large plastic moldings have been licked. Instead of putting paint out of the picture, plastics have opened up new market for product. CPVM, 29, #3, 3/55, p. 26

30.2.9. Montgomery describes finishing aircraft at De Havilland Aircraft's new finishing set-up. Finishing is centered around a 100 foot hanger, which is in effect a huge spray booth. Four 25-foot waterwash booths through which the air exhausts, line the rear wall

matching a woman's mind with

Colwell Color Cards

Speaking as one man to another, we both know that the color a woman is carrying around in the back of her mind may be unmatchable. However, Colwell Color Cards have been coming close enough to doing the job to sell millions of gallons of paints and varnishes in the last year. That's because Colwell-made Color Cards come close to perfection. Chips are clean, clear and exact. For the finest in Color Cards, call Colwell. When Colwell puts the chips down — sales go up!

Colwell Color Cards

A DIVISION OF THE COLWELL PRESS, INC.

501 South Sixth St. • FE 6-4347 • Minneapolis 15, Minn.

of the huge hanger. CPVM, 29, #4, 4/55, p. 5

30.2.10. Walter discusses compressed air in the workshop. Included are: characteristics of air, consideration of drain points, correct air trapping, separators, receiver drainage, mechanical air filters, chemical filters, and preventive maintenance. PI, 4, #9, 12/54, p. 49

30.2.11. Metcalfe discusses how hot spray solves many finishing problems. OF, 15, #11, 11/54, p. 20

30.2.12. Reves discusses the forming and finishing of the corvette plastic body. Includes; making the dies, forming the plastic sections, preparing the plastic parts for finishing, application of primer coats and finish coating. OF, 16, #4, 4/55, p. 9

30.2.13. Blount reports that the problem of applying several kinds of paint finishes at the same time has been solved efficiently in the plant at Stewart-Warner Corp., Chicago. Three separate conveyors are routed through several spray booths, but all go through one baking oven simultaneously on three different levels. Result—maximum production for the amount of floor space available. PF, 19, #9, 6/55, p. 140

30.2.14. One of the big problems in conventional spray painting is overspray. Johnson, in Part II of his series on finishing methods that cut waste, discusses systems that reduce it. CPVM, 29, #8, 8/55, p. 12

30.2.15. Shaffer describes what was gained by spraying flourescent fixtures electro-statically and how these gains were achieved. IF, 31, #7, 5/55, p. 26

30.2.16. Knof discusses spray problems with hot lacquers. He covers the following points: range of solids and viscosities of hot lacquers, principles of hot spray, solvents and resins, speed of spraying, film thickness, drying time, strength, cold check resistance, suggested methods of measuring film thickness, how to calculate film thickness when it can't be measured, control of film thickness, flow rates of hot lacquers and "bubbling", and the practical use of the bubbling chart. IF, 31, #7, 5/55, p. 48

30.2.17. Giersch describes how the American MonoRail Company paints overhead cranes by airless spray. IF, 31, #8, 6/55, p. 54

30.2.18. Narzekol describes how the Ambridge (Pa.) plant of the Spang-Chalfant Division of the National Supply Company applies paint to the inside of pipe by the use of long spray lances. IF, 31, #8, 6/55, p. 60

30.2.19. The Bakelite Company issued 4-page Release #11 discussing the application of vinyl maintenance paints by hot spraying.

cf:
5.1.1
30.1.6
30.1.10

Manufacturers:
Binks Mfg. Company
Burdett Mfg. Company
Conforming Matrix Corporation
The DeVilbiss Company
Finish Engineering Co., Inc.
M & E Mfg. Company
John B. Moore Corporation
Ransburg Electro-Coating Corporation

30.3.1. Ford reviews aerosol paints and lacquers. Includes: nomenclature, industrial development of aerosols, propellants, formulation problems, application problems, packing, uses of aerosol paints and aerosol paint remover. OF, 16, #2, 2/55, p. 11

30.3.2. Sharpe discusses the advantages and disadvantages of aerosol packages of paints, together with some of the problems of design and formulation which have to be overcome. PM, 25, #1, 1/55, p. 15

30.3.3. Southby gives a general idea of some of the problems involved in the packaging and formulation of paint and allied products in aerosol forms. PT, 19, #214, 7/55, p. 233

cf:
5.1.1

30.4.1. Welt discusses paint rollers and how they can act as an extra sales force. The author reviews the consumer, painting contractor, painter, paint dealer and wholesaler, paint manufacturer, brush manufacturer, publicity and advertising, types of rollers, roller construction, replacing the refill, and roller frame. APJ, 39, #21, 2/7/55, p. 78

30.4.2. Painting of huge storage tanks with spray or brush was impractical. Rollers were tried—with surprising results. CPVM, 28, #11, 11/54, p. 38

30.4.3. Swanson reviews paint rollers. How rollers help sell paint, and basic elements of roller are discussed. PL, 27, #3, 3/55, p. 12

30.4.4. Rothbart in the first of two articles on the paint roller, types and uses, discusses:
- Fill-type rollers
- Dip-type rollers
- The Rod and Nut Model
- Snap-off Model
- Slip-off Model
- Covers
- Cores
- Fabrics
- Wool covers
- Mohair Covers
- Dynel Covers

PL, 27, #4, 4/55, p. 18

30.4.5. In the concluding part of his article on the paint roller, types and uses, Rothbart discusses:
- Supplemental Tools
- Pressure-Fed Rollers
- Section Trays

PL, 27, #5, 5/55, p. 19

cf:
30.1.10
Manufacturers:
The Sulzer-Waegner Company

30.5.1. Though most of their finishes are supposed to be sprayed, Canada Cycle and Motor Company, Ltd., find that results have been excellent in their finishing of bicycles by dip. The dip method is used exclusively, hence the application of metallic paints presented a few problems, such as drainage, which were overcome after careful study. CPVM, 28, #6, 6/54, p. 14

30.5.2. Beaver discusses the flow-coating of aircraft parts. Experiments demonstrated the superiority of flow-coating after which a low pressure flow-coating line for aircraft parts was put into operation at the Torrence facility of Douglas Aircraft's Division at El Segundo, California. OF, 15,#11, 11/54, p. 17

30.5.3. The latest modifications of dip coating promise to save time and money. Johnson discusses dip coating of jewlery in this first of a 2-part article on dip coating. CPVM, 29, #6, 6/55, p. 5

30.5.4. The requirement for painting metal stampings and castings in quantity is being met at K-D Lamp Company by a recently installed conveyorized dip painting and baking installation. Poll describes this high production

system. PF, 19, #7, 4/55, p. 24

30.5.5. Bardin discusses how the Premax Division of Chisholm-Ryder Co., Inc. conveyor dip-paints glass fishing rods. IF, 31, #9, 7/55, p. 57

cf:
30.1.6

30.6.1. Hartwell discusses why quality paint brushes are still regarded as painters' best tool. He discusses what makes a good paint brush, choosing the brush, brushes versus rollers, the do's and don'ts of brushes, and proper use of brushes. He also presents a glossary of brush terms. OF, 16, #4, 4/55, p. 14

30.6.2. Rubin critically reviews the paint brush situation. This is the first of two parts. PL, 27, #8, 9/55, p. 16

30.7.1. Here is a generous peek into a plant where screen process printing has been developed to a high degree of speed and precision. You see not only hand operated squeegees but a special high speed automatic machine with power squeegees and intricate electronic controls which insure the perfect register of as many as eight different colors on new cloth. IF, 30, #2, 10/54, p. 65

CHAPTER 31

DRYING

31.1.1. Walter discusses the efficient operation of convection ovens for baking of paint. Direct fired air heaters are discussed. Also included is air circulation in relation to rapid baking. PI, 4, #6, 9/54, p. 33

31.1.2. McCormick discusses how unit heaters prove useful in paint drying operations. Details of oven construction are presented. OF, 15, #12, 12/54, p. 18

31.1.3. Davis describes how painters save time and money by using portable ventilators. These light ventilators are carried to the job whether it is painting boat interiors or buildings. CPVM, 29, #5, 5/55, p. 22

31.1.4. Herdlein reviews ovens for force drying wood finishes. He discusses: providing and controlling humidity in the oven, oven walls insulated and air seal at openings, ovens must be designed with the finishes in mind, features of good oven control equipment, considering the conveyor and where the oven is located, and getting the finish supplier and oven manufacturer together. IF, 30, #2, 10/54, p. 46

31.1.5. Method for drying coatings of paint, lacquer, enamel or synthetic resin on the outer plating of automotive vehicle bodies by inductive heating, characterized by the fact that at least a part of the induction coils for the inductive heating are movable with respect to the vehicle body and at least a part of the movable coils is introduced through openings present in the vehicle body for doors, windows and the like, transverse to the wall of the vehicle body into the inside of said body. USP 2,702,847

cf:
30.1.10

Manufacturers:
Burdett Mfg. Company
Despatch Oven Company
General Electric Company
Industrial Ovens, Inc.
George Kock Sons, Inc.
Michigan Oven Company
Ovens for Industry, Inc.

31.2.1. Walter reviews the factors influencing the efficiency of electric infra-red drying and baking. OF, 15, #11, 11/54, p. 6

31.2.2. Grinrod describes a special oven for two-tone car bodies. Faced with the problem of discoloration in convection baking of two-tone car bodies, Metropolitan-Vickers Electrical Co. Ltd., of England, developed an infra-red system. CPVM, 29, #4, 4/55, p. 22

31.2.3. Forrester reviews gas-fired equipment for infra-red baking of paint on metal components. The author discusses; facts on heat radiation, gas as source of heat, gas as heating medium, tunnel baking by radiant heat, smaller ovens, factor governing the choice and method of using radiant drying equipment for paint, flux density determines drying time, convection currents and shadows, and articles with varying sections and shielded surfaces. PI, 5, #1, 4/55, p. 113

Manufacturers:
Bettran Associates, Inc.
Burdett Mfg. Company
The Fostoria Pressed Steel Corp.
General Electric Company
Industrial Ovens, Inc.
Industrial Radiant Heat Corp.
George Koch Sons, Inc.
The Miskella Infra-Red Company
N.J. Thermix Co., Inc.
North American Electric Lamps Company
The Op-Al Electric & Mfg. Company
Ovens for Industry, Inc.
Penetray Corporation
Sill Industries
Swenson Associates
The Trippe Mfg. Company

CHAPTER 32

CHEMICAL REACTIONS

32.1.1. Gerson, et al, (Detroit Club) present part I, of their study of mechanisms of paint film breakdown. The following are included: enamel and lacquer formulations, panel preparation and Florida exposure, weatherometer exposures, methods of evaluation of deterioration, recapitulation of data gloss before polishing (chalking), gloss after polish (gloss retention), reflectance (color change), discussion and conclusions. Three appendices are included. POCR, 117, #24, 12/2/54, p. 58

32.1.2. Burrell presents a high polymer theory of the wrinkle phenomenon. The reason why tung and some other oils dry to a wrinkled instead of a smooth surface has never been satisfactorily explained. This investigation was undertaken to try to ferret out the mechanism of wrinkling.

Wrinkling occurs when a drying oil composition forms a surface skin lying on top of a liquid underlayer of monomer. This polymeric skin is swollen by the liquid layer. The strains set up by the swelling are relieved by wrinkling when the modulus of elasticity of the swollen gel is low enough.

By use of this theory, it is possible to formulate improved industrial wrinkle finishes that are more nearly foolproof in their tendency to give the same pattern time after time.

Factors Promoting Wrinkles: (See Table I).

IEC, 46, #10, 10/54, p. 2233

32.1.3. Aelony describes the direct esterification of phenols with higher fatty acids. This is contrary to the generally accepted theory that phenols may not be directly esterified with fatty acids but react with the acid chloride or anhydride rather than the acid. JAOCS, 32, #3, 3/55, p. 170

32.1.4. Seitzer & Tobolsky exposed solutions of common liquids with vinyl monomers (either styrene or methyl methacrylate) to a point source of β-particles and the resulting rates of polymerization were measured for several monomer concentrations. An expression was derived which relates rates of chain initiation to the measured rate of polymerization in terms of the average absorption coefficient for the β-particles. The number of radical chain starters produced in the various organic liquids per 100 e.v. of energy absorbed was thereby calculated. JACS, 77, #10, 5/20/55, p. 2687

Table I

Fine Wrinkles	Coarse Wrinkles
1. Small amounts of rosin nitrocellulose, or gilsonite (large amounts prevent wrinkles)	Addition of resins (but too much eliminate wrinkling.
2. Thin films	Thick films
3. Increasing wrinkling-oil length	Adding nonwrinkling oils or amberol
4. Large amounts of driers	less driers
5. Blowing tung oil or alkyds	Blowing perilla or linseed or boiling oils.
6. Fast evaporating solvents	Low boiling solvents
7. Baking without air-drying	Air-drying before baking
8. High initial temperature, 180°	Low initial temperature, 110°

32.1.5. Hiller studied the reaction of cellulose with acetic acid and water. Reaction curves for the reaction were studied. The reaction was found to be slow and severely limited in extent of reaction. JPS, 14, #78, 12/54, p. 555

cf:
23.1.15
23.1.19

32.2.1. Mehta, et al, studied the condensation of resorcinol and m-cresol with tung oil, to determine the optimum conditions for the maximum amount of m-cresol and resorcinol to be condensed with tung oil, and to determine the nature of the reaction. It is possible to determine the extent of reaction of the resorcinol or m-cresol with tung oil at ethylenic linkage and ester group. The results show that m-cresol reacts to a greater extent than resorcinol. PI, 4, #5, 8/54, p. 29

32.2.2. The principle of the method of Peneth and Hofeditz of studying gaseous free radicals has been employed by Goldfinger and Meffelfinger for chain reactions in liquid monomers. The half-life of a photochemically initiated polystyrene free radical has been found to be 0.088 ± 0.015 second. A simple extension of the technique should also give absolute values of the propagation rate constant and the chain transfer constant. JPS, 13, #68, 2/54, p. 123

32.2.3. In the 1954 Charles Goodyear Medal address, Whitby reflects on progress in the rubber industry. In it he discusses the biogenesis of rubber, and relates new types of polymerization-pop-

corn polymerization, graft polymerization, and block polymerization—to the development of new and improved elastomers, and believes that some aspects of nonsulfur vulcanization give credence to the possibility of developing cross-linked agents with antioxidant elements built into the vulcanized network. IEC, 47, #4, 4/55, p. 806

32.2.4. Fram, et al, studied emulsion polymerization by continuous feed of reactants. A technique for controlling extremely exothermic polymerizations by continuously adding the reactants to the reactor has been developed and polymerizations have been run to give about 1-gallon quantities of various polymer latices.

The continuous addition technique becomes especially desirable when a small percentage of a monomer, whose reactivity may be very different from that of the main monomer, is added to the reactor. A case in point is the preparation of an elastomer containing a small amount of a multifunctional monomer for subsequent cross linking during cure. IEC, 47, #5, 5/55, p. 1000

32.2.5. Cowan discusses polymerization, co-polymerization, and isomerization of drying oils. JAOCS, 31, #11, 11/54, p. 529.

32.2.6. Sims reports on catalysis and inhibition studies as part of a study of possible mechanisms in thermal polymerization of drying oils. Although polymerization is generally considered to proceed by a Diels-Alder mechanism, there are a number of reasons for suspecting that the reaction may be more complex. The high temperatures used in bodying an oil suggest that the mechanism is not simple. JAOCS, 32, #2, 2/55, p. 94

32.2.7. The reaction between styrene and t-butyl and cumene hydroperoxides in benzene at 70° has been studied, by Walling & Chang, by following monomer and peroxide disappearance and the molecular weight of the polymer formed. Results are consistent with the idea that almost all of the peroxide disappearance is accounted for by chain initiation and chain transfer reactions, although some (presumably polar) reaction to form styrene oxide may take place as well. JACS, 76, #19, 10/4/54, p. 4878

32.2.8. Lundberg discusses autoxidation and oxidative polymerization of drying oils. JAOCS, 32, #4, 4/55, p. 207

32.2.9. The rates of polymerization and degree of polymerization produced in styrene by the inhibitor-activator system benzoyl peroxidedimethylaniline were studied at several temperatures by Meltzer & Tobolsky. At 0° the initiation of polymer chains appears to result from a bimolecular reaction between peroxide and amine. At higher temperatures the kinetics are more complex. JACS, 76, #20, 10/20/54, p. 5178

32.2.10. Sittig discusses the use of sodium in the production of monomers and polymers. MP, 32, #12, 8/55, p. 150

32.2.11. Cyclic dimethylsiloxanes are converted into high polymers by the action of KOH at elevated temperatures. The kinetics of this process has been studiedby Grubb & Osthoff, using the monomer, octomethylcyclotetrasiloxane. JACS, 77, #6, 3/20/55, p. 1405

32.2.12. Endres and Overberger continue the study on ionic polymerization. This fifth part discusses molecular termination in the cationic polymerization of styrene catalyzed by stannic chloride. JACS, 77, #8, 4/20/55, p. 2201

32.2.13. Rhodes presents a review of condensation polymerization. PIM, 70, #6, 6/55, p. 10

32.2.14. Fordham and Williams studied amines as activators for polymerization of butadiene and acrylonitrile in emulsion. More reactive amines are required as the temperature of polymerization is reduced. IEC, 47, #9, 9/55, p. 1714

32.2.15. Uraneck, et al, studied the effects of impurities in copolymerization of butadiene and styrene in manufacture of GR-S. IEC, 47, #9, 9/55, p. 1724

32.2.16. Roche presents the eighth I. E. C. Chemical engineering review on polymerization. IEC, 47, #9, 9/55, p. 1903

32.2.17. Orr & Williams studied the efficiency of initiation by cumyloxy and sulfoxy radicals in free radical polymerization. JACS, 77, #14, 7/20/55, p. 3715

32.2.18. Ferington and Tobolsky studied organic disulfides as initiators of polymerization. The compound tetramethylthiuram disulfide has been used as polymerization initiator with methyl methacrylate and styrene monomers at 70°. It is surprisingly only somewhat less reactive as an initiator than benzoyl peroxide at 70°. JACS, 77, #17, 9/5/55, p. 4510

32.2.19. O'Brien & Gornick studied chain transfer in the polymerization of methyl methacrylate. Part I deals with transfer with monomer and thiols and the mechanism of the termination reaction at 60°. JACS, 77, #18, 9/20/55, p. 4757

32.2.20. The relative reactivities of polymer radicals in vinyl polymerization have been correlated semiquantitatively according to the Alfrey-Price Q' and e scheme, by Herbst & Martin. JPS, 14, #76, 10/54, p. 391

32.2.21. Woodward & Smets synthesized block copolymers by heating a polymer, containing peroxidic linkages, in the presence of another monomer. The peroxide groups were introduced into the first polymer by initiating the controlled polymerization of its monomer with phthalyl peroxide. Separation of the block copolymers from the two parent homopolymers was made possible by their different solubilities in selected solvents or their mixtures. JPS, 17, #83, 5/55, p. 51

32.2.22. The kinetic study of the polymerization of methyl methacrylate initiated by H_2O_2 in toluene, ethyl acetate, and methyl ethyl ketone as well as in bulk has been made. The catalyst has no inhibition period and follows the square root relation. The initiation order is unimolecular with respect to the monomer in the first two solvents and is half-molecular with respect to methyl ethyl ketone. JPS, 17, #83, 5/55, p. 65

32.2.23. Pierson, et al, studied bis-type modifiers in polymerization. This article reports on the behavior of various disulfides in bulk styrene polymerization. JPS, 17, #84, 6/55, p. 221

32.2.24. Measurements have been made, by Slowinski & Claver, of the rate of thermal polymerization of styrene by observation of the infrared absorption spectrum of polymerizing samples in infrared absorption cells at 100° C. No

effect of cell thickness on polymerization was noted, and the rate obtained agrees well with previously published values. An infrared method for determination of residual styrene monomer in polystyrene is described, and it's possible application to rate studies on systems at high percent conversion is noted. JPS. 17, #84, 6/55, p. 269

32.2.25. Costanza, et al, studied bis-type modifiers in polymerization. This second article compares the effectiveness of various compounds in emulsion butadiene and bulk styrene polymerizations. JPS, 17, #85, 7/55, p. 319

32.2.26. Arlman studied cross-termination in copolymerization. A formula is developed attempting to give a quantitative explanation for the variation of the apparent cross-termination coefficient in copolymerization as a function of the composition of the reaction mixture. JPS, 17, #85, 7/55, p. 375

32.2.27. Lal & Green studied the effect of amine accelerators (mostly tertiary amines) on the polymerization of methy methlacrylate with benzoyl peroxide. JPS, 17, #85, 7/55, p. 403

cf:
2.1.2
3.1.5
14.1.8
17.2.3
18.2.4
23.1.15
24.10.2
38.5.3

32.3.1. Lundberg reviews the autoxidation of fats and oils. Following a discussion of the importance of this reaction, historical review, and modern advances, the author discusses the autoxidation of linoleates, the mechanism of peroxide formation, peroxide decomposition, pro-oxidants, antioxidants, autoxidation in relation to unsaturation, and secondary products. JAOCS, 31, #11, 11/54, p. 523

32.3.2. Skellon summarizes the advances in our knowledge of the chemistry of drying oils and their component acids. He also presents a brief review of current mechanisms put forward in explanation of such autoxidation and the bearing of this work on the problem of oxidation polymerization in drying of oils is discussed. PM, 25, #5, 5/55, p. 186

32.3.3. Crecelius, et al, studied drying oil oxidation, its mechanism, film formation, and degradation. Strong evidence was found that under artificial lighting conditions certain definite chemical reactions take place in films of linseed and dehydrated castor oil, such as formation of OH groups, probably hydroperoxide groups, increase in carboxyl groups, shift toward conjugation of double bond systems, and changes involving cis-trans isomerization. IEC, 47, #8, 8/55, p. 1643

32.3.4. Marek presents the eighth I. E. C. chemical engineering review on oxidation. IEC, 47, #9, 9/55, p. 1896

cf:
23.1.15
23.1.16
24.2.2
24.2.3
32.2.8

32.4.1. Gall & Greenspan describe a modified peracid process for making epoxy compounds from unsaturated fatty acid esters. Hitherto the only known procedure for epoxidizing unsaturated fatty acid esters with peracetic acid has required the use of a preformed peracetic acid.

A novel in situ epoxidation process has been developed employing 0.5 mole of acetic acid to 1.0 mole of ethylene unsaturation and 1.1 moles of hydrogen peroxide in the presence of catalytic amounts of sulfuric acid and reaction temperatures of 60° to 70°C. Using this process, representative monohydric and polyhydric alcohol esters of unsaturated fatty acids have been converted to the corresponding epoxy esters in 70 to 85% yields.

The in situ method described possesses decided economic and processing advantages over the preformed peracid process and is really adaptable to large scale use. IEC, 47, #1, 1/55, p. 147

cf:
27.3.16

CHAPTER 33

VEHICLE MANUFACTURING

33.1.1. It was not so long ago that the manufacturer of varnishes and paint grinding vehicles was a secret art handed down from father to son. Farnow Varnish began manufacturing varnishes and vehicles in 1938. This article reviews the advances made by Farnow Varnish in vehicle manufacture. Fire safety and the laboratory are also discussed. PVP, 44, #12, 12/54, p. 28

33.1.2. Yokell discusses the application of engineering fundamentals to vehicle manufacture with a suggested method to reduce processing costs by reducing upheat time. PIM, 70, #9, 9/55, p. 57

cf:
34.1.7

Manufacturers:

Bethlehem Foundry & Machine Company
Blaw-Knox Company
Brighton Copper Works, Inc.
Buflovak Equipment Division
Lee Metal Products Co., Inc.
Liquid Carbonic Corp.
Patterson Foundry & Mach. Company
The Pfaudler Company
Process Eng. & Mach. Company
Selas Corp. of America
Sparkler Mfg. Company

CHAPTER 34

PAINT MANUFACTURE

34.1.1. Gates-Reed begins a series of articles tracing the history of the paint industry in India. This first article describes the "Wright Era"—describing the part A. C. Wright had in pioneering the paint industry in India. PI, 4, #1, 4/54, p. 139

34.1.2. Gates-Reed continues tracing the history of the paint industry in India. This second part discusses early raw materials sources. PI, 4, #2, 5/54, p. 34

34.1.3. Gates-Reed continues tracing the history of the paint industry in India. This third article discusses the advent of red oxide. PI, 4, #3, 6/54, p. 39

34.1.4. Gates-Reed continues tracing the history of the paint industry in India. This fourth article continues the "Wright Era." PI, 4, #5, 8/54, p. 27

34.1.5. Gates-Reed continues tracing the history of the paint industry in India. This fifth article discusses the "Pioneer Himself." PI, 4, #7, 10/54, p. 31

34.1.6. Gates-Reed continues tracing the history of the paint industry in India. This sixth article discusses from Oxford onwards. PI, 4, #8, 11/54, p. 29

34.1.7. Haines, et al, present a staff-industry collaborative report on resin and paint production—1954 style. Resins and paints established a new record last year when dollar volume of sales reached the $1.4 billion level. Since 1939 the industry has shown a steady growth; the value of products marketed during 1953 more than tripled prewar amounts. Technological improvements have contributed greatly to this market growth.

In the latest paint factories there is a definite trend toward larger equipment; most factories prefer to have their own resin plant which affords maximum flexibility of operation. De Soto's resin plant serves a dual purpose; it manufactures vehicles for the paint factory and also produces other type materials such as plasics, adhesives, chemical-resistant finishes, and specialty products for the petroleum, chemical, and food industries.

Paint manufacturing economy at Garland centers largely around efficient handling of the large number of raw materials and finished products. The plant consumes some 427 different types of vehicles and pigments for the production of almost 1500 items. IEC, 46, #10, 10/54, p. 2010

34.1.8. Fair discusses how to determine equipment replacement time. A number of factors to be considered are presented. These factors should be balanced against cost and other financial factors. APJ, 39, #31, 4/18/55, p. 114

34.1.9. Weaver presents a compilation of 351 articles dealing with equipment costs, operating costs, estimating methods and project analysis. CE, 61, #10, 10/54, p. 185

34.1.10. Weaver brings up to date his survey of the cost estimation—engineering economics literature. See 34.1.9. for the previous survey. CE, 62, #6, 6/55, p. 247

34.1.11. Poor installation is the biggest cause of floor headaches. Weissman and Wyder review the installation of floors for long life. A quick guide to floor installation, how to get the floor you expected, and helpful tips on floor installation are discussed. FMM, 112, #10, 10/54, p. 114

34.1.12. 156 companies tell you how to upgrade your plant's electrical performance, in Factory Management and Maintenance's Electrical Survey. FMM, 112, #11, 11/54, p. 84

34.1.13. Weissman & Wyder review the maintenance of floors to make them last longer. Includes a "Quick Guide to Floor Maintenance" chart covering concrete, hardwood, resilient flooring materials, oxychloride (magnesite), quarry tile and brick, metal armored, mastic, and wood block. FMM, 112, #12, 12/54, p. 114

34.1.14. The study of chemical and physical properties of paint, its raw materials and even the applied film, is becoming more and more extensive. Corcoran reviews some of the applications of physics in obtaining a fuller understanding of the fundamental properties of these materials such as adhesion, color, particle size, and molecular constitution. PM, 24, #11, 11/54, p. 395

cf:
26.4.7

34.2.1. Rushton reviews mixing. 26 references are cited in reviewing general and review papers, particle and solids mixing, mixing and extraction, gas-liquid operations, blending, heat transfer, mechanical features, shaking, and miscellaneous. IEC, 47, #3, 3/55, p. 582

34.2.2. Paulson discusses the control of putty manufacture. In the manufacture of putty by edge-runner mill, the variation of power consumed with time affords a useful guide both to the processing time required and to the achievement of the optimum pigment/binder ratio. JOCCA, 38, #1, 1/55, p. 43

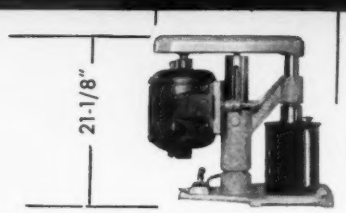
34.2.3. Jeanne discusses how baffles increase mixing action and

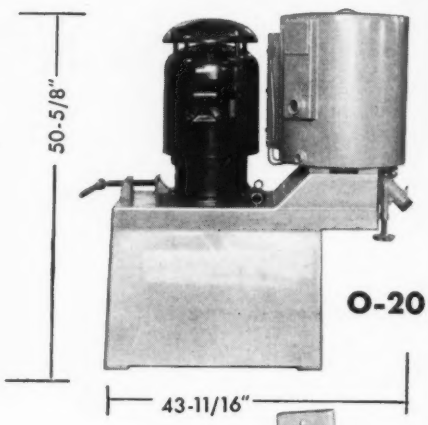
KADY® MILL PERFORMANCE

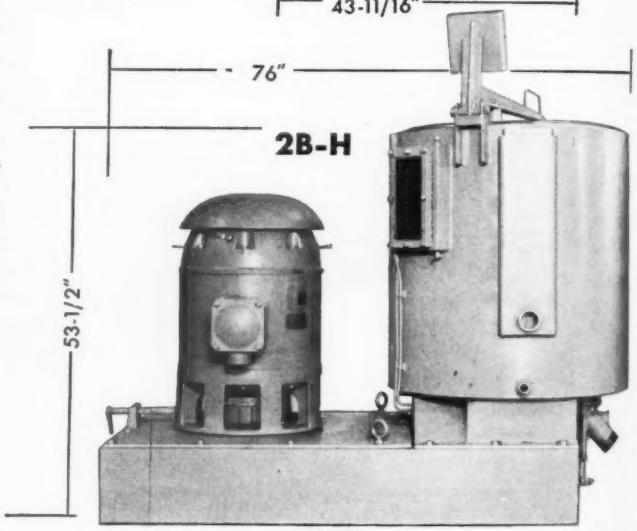
A most important factor to bear in mind in the purchase of special equipment is EXPERIENCE. Both quality and rate of production are closely related to the helpful experience the maker can give the user.

Today, of the hundreds of Kady Mills in operation, many belong to users who operate more than one, some more than 12 Kady Mills. Voluminous data, from this experience in the widest variety of dispersion problems, *prove* that in a high percentage of the products of the coatings and ink fields, NOTHING IS FASTER THAN A "KADY".

Now, with six years of manufacturing experience, Kinetic Dispersion Corporation can furnish equipment that is engineered for YOU not only on the drawing board, but through the experience of SEVERAL MILLION OPERATING HOURS in the manufacture of every kind of paint, lacquer, enamel, gravure and aniline ink material.







"KADY DEEDS"

- With Model 4 B-H, a dispersion base for 6000 to 8000 gallons of 7 N. S. white enamel per 8-hour day.
- With Model 4 B-H, dispersion slurries for finishing P.V.A., Latex or Acrylic house paints; 7000 to 8000 gallons per day.
- With Model 4B-H, dispersion bases for 6¼ N. S. Utility Enamels in almost all colors at the rate of 750 G. P. H.
- New Kady Mill users are amazed at the cleaner color, the higher gloss, the drop in labor cost per gallon in a wide variety of materials.

THE KADY MILL

KINETIC DISPERSION CORPORATION,

efficiency. PIM, 69, #11, 11/54, p. 54

34.2.4. Apparatus for mixing rubber or other plastic material and including a base, a smooth mill roll journaled on said base, a helically grooved roll journaled on said base and forming a bight with the said smooth roll, and a plate-like casement of arcuate contour surrounding the grooved roll, said casement having a plurality of bores extending therethrough in the direction of the arc therein, edge portions of said casement narrower than the casement edge being removed to connect ends of adjacent bores, and cover plates secured to said casement over the removed edge portions of same to seal over the connections between adjacent bores and form a connection therebetween. USP 2,696,635

Manufacturers:
Abbé Engineering Company
Paul O. Abbé, Inc.
Alsop Engineering Corporation
Conn & Company
Craddock Equipment Co., Inc.
The J. H. Day Co., Inc.
Eastern Industries, Inc.
Gabb Special Products
Hermas Machine Co., Inc.
Herman Hockmeyer & Company
Hy-R-Speed, Inc.
International Engineering, Inc.
Kent Machine Works
Kinetic Dispersion Corp.
The Kiverel Company
Mixing Equipment Co., Inc.
Morehouse-Cowles, Inc.
New England Tank & Tower Company
The Patterson Foundry & Machine Company
The Patterson-Kelley Co., Inc.
Read Standard Corporation
Charles Ross & Son Company
Southern Electric Products
Southwest Mill Industrial Equipment Company
The Stevenson Company
Sturtevant Mill Company
Troy Engine & Machine Company
Turbo-Mixer

34.3.1. The New York Club presents Part V of a study of pigment dispersion dealing with the behavior of toluidine red. Compared to rutile Ti O_2, toluidine red is lower in specific gravity, coarser in particle size, equal weights have equal surface area but Toluidine red has 3X volume of Ti O_2, and toluidine red is soluble in a number of paint liquids in which TiO_2 is insoluble. Toluidine red requires a tighter mill setting. Initial gloss appears to be little affected by the various methods of dispensing toluidine red, but the tendency to haze as the film aged was reduced on

On Latex Paints...

Top of mixer extends to 2d floor, where it is charged. Note dust control hood.

Note thoroughly dispersed and blended latex paint in mix just before discharge.

Finished mix is discharged on first floor through valve in bottom of mixer. Photographs show Abbe Dispersall Mixer installation in plant of Pacific Paint & Varnish Co., Berkeley, Calif.

- Cut Mixing Time by One Half or Better
- Do The Entire Job in ONE Machine over the Complete Range of Your Color Card
- Get Complete Dispersion of ALL Ingredients, Regardless of Formulation
- Change Over from One Color to Another (Including White) in about Ten Minutes
- Get Maximum Color Values from a Minimum of Color
- Fill Directly from the Mixer or Pump to Storage

The Abbe' Dispersall Mixer

pays for itself in a year or less!

WRITE FOR CATALOG AND COMPLETE DATA

ORIGINATORS OF ABBE ENGINEERING CO. ABBE PEBBLE MILLS

ABBÉ ENGINEERING CO.
50 Church Street • New York 7, N. Y.
Address Department 64

the films in which better dispersions occurred. OD, 26, #358, 11/54, p. 1093

34.3.2. Hoback presents part III of "Pigment Dispersion—Theory and Practice". This part discusses intensive mixer operation, pebble mill operation, and pigment dispersion in the liquid composition, and in the film state. A summary of the entire three parts is presented. APJ, 39, #4, 10/11/54, p. 72

34.3.3. The problem of wetting and dispersion of pigments is discussed, by Dharap, with emphasis on the fundamental factors relating to the phase to be dispersed and the dispersion medium. The problem, however, presents difficulties of a practical nature, as there is no suitable method for determining the extent of dispersion. The limitations of the available methods are examined, and the possibility of treating wetting and dispersion as a rate process discussed. PI, 4, #1, 4/54, p. 105

34.3.4. The wetting and dispersion of pigments in plastics and rubbers has certain peculiarities owing to the inherent nature of plastics and rubbers. The high viscosity of plastics and rubbers makes it necessary to carry out the processing at elevated temperatures, thereby restricting both the type of pigments that could be employed and also the methods of obtaining efficient dispersion. Factors which determine the rate and extent of wetting and dispersion in different plastics and rubbers are discussed, by Nagarsenkar, with reference to a few selected pigments. The limitations of judging the extent of dispersion by determining the modulus of elasticity are pointed out and an alternate method suggested. PI, 4, #1, 4/54, p. 111

34.3.5. The phenomenon of wetting and dispersion of pigments in paints is specific to a particular type of binder and as such generalization is not possible. The conditions for getting good dispersion in oil paints, pigmented varnishes and lacquers, water paints and distempers, and emulsion and latex paints are reviewed, by Potnis, and it is pointed out how by choosing the appropriate ingredients, it is possible to get dispersions of maximum stability with a minimum amount of energy consumption. PI, 4, #1, 4/54, p. 116

34.3.6. The majority of printing inks are based on litho varnishes, appropriate mixtures being used to suit a particular method of printing. In view of the special performance that is expected, the number of pigments that can be employed in printing inks is restricted. The conditions that determine the rate and extent of dispersion of a few pigments, including carbon black, are examined by Varawalla, and suggestions made for obtaining increased efficiency from the point of power consumption. PI, 4, #1, 4/54, p. 121

34.3.7. Aserkar discusses the wetting and dispersion of pigments. Included are: wetting and sedimentation, nature of the constituents, surface active agents, grinding, effects of wetting, false body, chemical aspects, dispersion, prevention of flocculation and settling, application of the phenomena in paints and printing inks, and conclusions. PI, 4, #2, 5/54, p. 21

34.3.8. Whitney, et al, (New York Club) report on a study of pigment dispersion-behavior of toluidine red. Includes introduction, objective, experimental approach, experimental data wetting nature of toluidine, theoretical interpretation, mixer/roller mill dispersion, low solids pebble mill and steel ball mill dispersion, relationship between dispersion and film characteristics, masstone and tint be-

C'mere boy, and I'll tell you where to get FEIN'S PAILS and CANS!

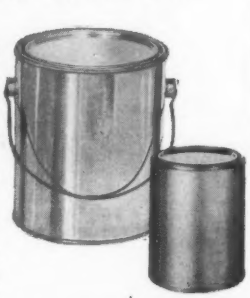
Inquire today about our unique Mixed Carload Shipment Plan. Fein's complete line includes: Steel Pails; Varnish, Shellac and Thinner Cans: 1 Gallon and 1 Quart Triple-Tite Paint Cans. Fein's gives you *exactly* the type container you need...*exactly* when you need them.

FACTORIES AND SALES OFFICES:

FEIN'S TIN CAN CO., INC. . . . . Brooklyn, N. Y.
ATLAS CAN CORP. . . . . Brooklyn, N. Y.
PEERLESS CAN CORP. . . . . Brooklyn, N. Y.
COMMERCIAL CAN CORP. . . . . Newark, N. J.
STANDARD CAN CORP. . . . . Pittsburgh, Pa.

SALES OFFICES: Philadelphia, Baltimore, Cleveland, Cincinnati, Boston
The Smith Can Co., Atlanta, Georgia, Magic City Bottle & Supply, Miami, Fla.

PHOTO: CONSTANCE BANNISTER



1 Gallon and 1 Quart Triple Tite Cans illustrated are just two cans in our complete line of steel pails, varnish, shellac and thinner cans. These triple tite cans can be lithographed and lined for your individual product.

havior, gloss behavior, and summary and conclusions. POCR, 117, #24, 12/2/54, p. 48

34.3.9. Although the three-roll mill has been widely used for the past 50 years for the production of dispersions, no previous fundamental studies of its performance have been published. These three papers, by Maus, et al, provide a basic understanding of roll mills in order to develop improved designs and techniques for their use.

In the initial study only one nip at a time was considered and the material used was an unpigmented oil. The variables investigated and correlated by dimensional analysis were roll speed, roll speed ratio, clearance, viscosity, roll diameter, roll length, and power input. Correlation equations were developed according to fluid mechanics for two cases—a feed nip with a bank of material and an apron nip with a minimum of material. These correlations involve the Power number, Reynolds number, Froude number, and roll speed number so that the final equations took the form:

$$PN = K\,(RN)^{a}\,(FN)^{b}\,(R\,SN)^{c}.$$

From this fundamental engineering study, a new mill was developed. Called the floating roll mill, one of the end rolls is fixed instead of the center roll so that only two screw jacks are needed to tighten and to adjust the mill. Thus the 80 possible ways in which the conventional four-point adjustment mill can be out of adjustment is reduced to eight. Increased production averaging 15% has been realized industrially because four-point mills are often run when out of perfect balance. Finally, using the floating roll mill, a correlating equation was developed for the complete three-roll mill and tested with extensive data:

$$PN = K(RN)^{-2/3}\,(FN)^{-1/3}$$

where K is a constant depending on the roll speed ratio. IEC, 47, #4, 4/55, p. 696

34.3.10. Allyn & Scheifele discuss pigment dispersion in acrylic paint systems. It includes principles of dispersion, dispersion in emulsion systems, equipment used in paint industry, manufacture of emulsion paint in pony mixer, pigment dispersants, determination of dispersant activity, fluidity titrations, dispersion of tinting colors, and pigment properties in water dispersed systems. OD, 27, #367, 8/55, p. 520

34.3.11. The Abbé Engineering Company issued 12-page catalog #77 describing Abbé pebble and ball mills, and grinding media.

34.3.12. The Kinetic Dispersion Corporation issued 46-page booklet describing the Kady Mill. Also issued was formula bulletin #2—"Water paints and the Kady mill."

Manufacturers:
Abbé Engineering Company
Paul O. Abbé, Inc.
Bowser, Inc.
Cartrite International, Inc.
Chemicolloid Labs., Inc.
Coors Porcelain Company
Combustion Engineering, Inc.
Hardinge Co., Inc.
Kent Machine Works
Kinetic Dispersion Corporation
J. M. Lehmann Co., Inc.
C. W. Logeman Company
McDanel Refractory Porcelain Company
Manton-Gaulin Mfg. Co., Inc.
Marco Company, Inc.
Miller P. Miller & Son., Inc.
Morehouse Cowles, Inc.
The Patterson Foundry & Machine Company
The Pennebacker Company
Pulverizing Machinery Company
Charles Ross & Son Company
Schutz-O'Neill Company
Southwest Mill Industrial Equipment Company
The Stevenson Company
Sturtevant Mill Company
Tri-Homo Corporation
Troy Engine & Machine Company
U. S. Stoneware Company

34.4.1. It is not only necessary to make good paint, but it has to be packed in durable, attractive containers. A few tips on packaging are presented by Algar. An essential point to consider in packaging is to provide ample ullige or headspace. The following values are generally accepted:

Volume Capacity	Ullige
1 gallon	7.5%
1/2 "	7.5%
1/4 "	7.5%
1/8 "	10.0%
1/6 "	10.0%
1/32 "	15.0%
1/64 "	15.0%

PI, 4, #2, 5/54, p. 32

34.4.2. Lippman & Logan discuss the packaging of polyvinyl acetate paints. Metal-pH-air, corrosion ferrous and ferric, and catalytic oxygen are included. POCR, 117, #22, 11/4/54, p. 21

34.4.3. Rodes discusses the marking of drums for identifying their contents. Litographing, embossing, rubber stamps, stenciling, silk screens, labels and decalcomanias are reviewed. IEC, 47, #5, 5/55, p. 101A

34.4.4. What does the amateur painter want to know when he or she starts to use a can of paint? This article, by Reno, presents a list of 21 types of information which should be included on the label. This information should also be included on sample cans and labels as well as the commercial containers. APJ, 39, #39, 6/13/55, p. 96

34.4.5. Das discusses cans for the paint industry. He reviews basic container construction, the closure, size of containers, surface design, and how container standardization reduces costs. PI, 5, #2, 5/55, p. 37

34.4.6. Foy describes how conveyorized packaging at the Foy Paint Company has increased capacity 50%, has cut packaging costs, and has improved warehousing. PVP, 45, #8, 7/55, p. 32

Manufacturers:
American Can Company
Beacon Printing Co., Inc.
Bennett Industries, Inc.
Bowser, Inc.
Burt Machine Company
The Cleveland Steel Barrel Company
Continental Can Co., Inc.
Crown Cork & Seal Company
Davies Can Company
Dri-Flo Manufacturing Company
Elgin Manufacturing Company
Fein's Tin Can Co., Inc.
Geuder, Paeschke & Frey Company
The Grief Bros. Cooperage Corporation
Hind & Dauch Paper Company
The Hopkins Company
Inland Steel Company
The Karl Kiefer Machine Company
MRM Company, Inc.
National Can Corporation
National Equipment Corporation
Popper & Sons, Inc.
The Pormix Corporation
Pressed Steel Tank Company
W. C. Ritchie & Company
U. S. Steel Products
Vulcan Containers, Inc.
Vulcan Steel Container Company
F. H. Wiessner, Inc.

34.5.1. Chalmers, et al, present a comprehensive treatment on filtration. The approach is practical and logical, emphasizing latest designs and operating techniques. Filtration theory, filter selection, and filter equipment are discussed. CE, 62, #6, 6/55, p. 191

34.5.2. Flood reviews the use of centrifugals for separating solids from liquids, either by sedimenta-

tion or filtration. In either case, they produce greater separating forces than other equipment, broadening the range of solid-liquid separators. CE, 62, #6, 6/55, p. 217

Manufacturers:
Alsop Engineering Corporation
The Cuno Engineering Corporation
Filipaco Industries
Industrial Filter & Pump Mfg. Company
Porous Plastic Filter Company
Sparkler Mfg. Company
Syntron Company
D. R. Sperry & Company

34.6.1. Rao discusses statistical quality control methods in chemical industries. PI, 5, #2, 5/55, p. 30

34.6.2. "Are you quality control conscious in the laboratory and on the test racks?" asks Kredentser. The quality of the paint a manufacturer produces can't depend on hit-and-miss methods. His procedures must be precise. Here a number of quality control tests are described. CPVM, 29, #8, 8/55, p. 16

34.7.1. Sayles describes atmospheric pollution control. He covers the problems of smog, philosophy and complexities of pollution control, methods of fume elimination, and discusses reclamation methods. OD, 27, #367, 8/55, p. 566

34.7.2. The Air Pollution Control Association issued Annual Meeting Paper No. 55—25: "Range of Applicability of Catalytic Fume Burner."

Manufacturers:
Catalytic Combustion Corporation
Claude B. Schneible Company
Schutte & Koerting Company
The Stevenson Company

CHAPTER 35

MATERIALS HANDLING

35.1.1. Johnson reviews the use of fork trucks for material handling, engineering principles, application principles, fork truck attachments, costs and economics, and fork truck installations are discussed. Numerous examples are illustrated to clarify the text. OD, 26, #357, 10/54, p. 963

35.1.2. Fair discusses how better storeroom layout boosts profits. No firm is too small to realize increased profits through more efficient handling of materials where storage is properly planned. APJ, 39, #16, 1/3/55, p. 66

35.1.3. Wesson reviews materials handling. 41 references are cited in reviewing fork lift trucks, pallets, warehousing, conveyor systems and bulk handling. IEC, 47, #3, 3/55, p. 578

35.1.4. Strong discusses why you must coordinate your material handling. He includes the usual approach and what's wrong with it and the coordinated approach and what's right with it. CE, 61, #10, 10/54, p. 194

35.1.5. Duke & Anderson describe a novel resin melter. Electric immersion heaters and an auxiliary heat transfer fluid double team to evaporate hexane and melt resin in two-changer unit. Operations are safer, cheaper, and nearly trouble-free. CE, 61, #11, 11/54, p. 169

35.1.6. Research on hoppers points to better understanding of solids flow. Work described by Jenike, though not yet complete, can even now help avoid troubles with bins and hoppers. Eventually, it should enable solids handling designs to cut capital costs, assure better results. CE, 61, #12, 12/54, p. 175

35.1.7. Thomas A. Edison, Inc. has issued 28-page booklet on "Modern Material Handling."

Manufacturers:
Barksdale Company
Carrier Conveyor Corporation
Clark Equipment Company
Thomas A. Edison, Inc.
The Elwell-Parker Electric Company
Filpaco Industries
Fuller Company
Hyster Company
The Lunkenheimer
Market Forge Company
The Mercury Mfg. Company
Mitchell Industrial Tire Co., Inc.
Morse Mfg. Co., Inc.
Neptune Meter Company
Nutting Truck & Caster Co., Inc.
The Rapids-Standard Co., Inc.
The Raymond Corporation
Read Standard Corporation
Revolator Company
Southwest Mill Industrial Equipment Company
Star Welding & Mfg. Division
Stephens-Adamson Mfg. Company
Stewart-Warner Corporation
Towmotor Corporation
Whiting Corporation
Wilder Mfg. Co., Inc.

35.2.1. Feeding and proportioning equipment for handling liquid chemicals is surveyed, by Henke, from the standpoint of equipment available, criteria for selection for various uses, and corrosion of various materials of construction of which this equipment is made by solutions most likely to be handled.

This is a survey of the field of feeding and proportioning chemicals from the application and equipment viewpoints. Equipment discussed is limited to solution feeding. Tables of corrosion resistance to chemical media for the various materials found in commercial equipment are included. IEC, 47, #4, 4/55, p. 684

35.2.2. In plant design you can facilitate the specification of numerous centrifugal pumps by using a standardized data sheet to calculate total dynamic head and NPSH data. Such a sheet combining conciseness with simplicity, completeness, orderly arrangement and ease of reference is presented by Cox. CE, 62, #4, 4/55, p. 170

35.2.3. When centrifugal pumps feed a common pipeline their performance will vary with system conditions. Sag presents a simple, graphical method to find the actual working point of each pump under any set of conditions. CE, 62, #7, 7/55, p. 140

Manufacturers:
Blackmer Pump Company
Bowser Inc.
The Denison Engineering Company
Eastern Industries, Inc.
Eco Engineering Company
Falls Industries, Inc.
Filpaco Industries
Foster Pump Works, Inc.
General Ceramics Corporation
Goulds Pumps, Inc.
Industrial Filter & Pump Mfg. Company
Ingersoll-Rand Company
Lindquist Pump Corporation of Texas
Manton-Gaulin Mfg. Co., Inc.
Marlow Pumps
Milton Roy Company
Naresco Equipment Corporation
The New York Air Brake Company
Philadelphia Pump & Machinery Co., Inc.
Schutte & Koertig Company
Western Machinery Company
A. R. Wilfrey & Sons, Inc.
Worthington Corporation

35.3.1. Hoag discusses the need for special protection of large motors. In general the destructive agents include:

1. moisture, e.e., water in form of dampness, humidity, fog, mist, spray, etc.
2. corrosive vapors, mists, gases, salts, etc.
3. explosive vapors, gases, dusts, powders, etc.
4. electrically conductive dusts, powders, etc.
5. abrasive dusts, powders, etc.

CE, 62, #5, 5/55, p. 187

Manufacturers:
The Denison Engineering Company
General Electric Company
Merkle-Korff Gear Company
U. S. Electrical Motors, Inc.
Westinghouse Electric Corporation

35.4.1. Looking for ways of speeding blending operations? This article describes a special heavy-duty hose coupling which is actually used in the petroleum industry and which is applicable to the paint industry. It is a solution to a piping problem frequently encountered in the paint industry. OD, 27, #360, 1/55, p. 42

35.4.2. Sverdrup discusses the theory of hydraulic flow control. In the design of any hydraulic circuit, the rate of flow is determined by the resistance of various components and by the pressure differential across the circuit. Because, in spite of its importance, there is a serious lack of published data on hydraulic resistance, equations are derived herein for the flow rate of any circuit-including both parallel and series types. This is followed by a flow analysis of such components as valves, venturis, orifices and other flow limiting devices. Comprehensive examples illustrate the application of the analysis to practical design problems. PE, 26, #4, 4/55, p. 161

35.4.3. Smart describes the piping of flammable liquids at the Allis-Chalmers Norwood (Ohio) plant. FMM, 113, #4, 4/55, p. 110

CHAPTER 36

SAFETY

36.1.1. Bohlen presents a summary of preliminary tests on the spontaneous combustion of various catalysts for epoxy resins. It is believed that the tests show a trend. OD, 27, #364, 5/55, p. 261

36.1.2. The Plant Problems Committee of the Philadelphia Paint & Varnish Production Club has compiled an operating manual for production employees in the paint and varnish industry.

While our industry is not classed as dangerous or hazardous in itself, many of the materials used are inflammable and carelessness in operating machinery of any kind can cause accidents. OD, 27, #364, 5/55, p. 288

36.1.3. Bullock discusses human frailties vs your safety. Consider how the human factor causes accidents and you will have a good start towards improving your safety record. Human frailties is now the main culprit.
CE, 62, #4, 4/55, p. 176

36.1.4. Walter describes how one chemical company spent time and money to produce an enviable employee safety record, by reducing the hazards in handling chemicals. CPVM, 28, #8, 8/54, p. 6

36.1.5. Johnson explains why your fire extinguisher could let you down. There is no one extinguisher that can handle all classes of fire—and all classes can and do happen where paint is used. The various types of extinguishers and fires are discussed and the correct type of extinguisher for each type of fire is discussed. CPVM, 28, #10, 10/54, p. 48

36.1.6. Grupp discusses how organic finishing occupational diseases cost millions. 56 chemicals and their usage and possible effect on workers are listed. Bibliography includes 24 books, 6 booklets, and 2 periodicals. OF, 15, #12, 12/54, p. 14

36.1.7. Braidech & Ford review fire safety in organic industrial finishing. Includes basic fire causes, flammable liquids, fire protection equipment, dipping and flow coating operations, flow coating, dip tank fire protection, spray finishing operations, electrostatic equipment, drying ovens, and fire prevention programs. Lists fire protection organizations in the U. S. A. and lists publications on fire safety. OF, 16, #5, 5/55, p. 9

36.1.8. The fire hazard of a painted surface is an important consideration when the paint is applied to large areas of combustible materials. Pickard discusses some of the hazards presented by a painted surface and the tests which are carried out, to assess them. PM, 24, #12, 12/54, p. 426

36.1.9. Fair discusses the figuring of the costs of accidents. APJ, 39, #50, 8/29/55, p. 73

Manufacturers:
W. H. Brady Company
E. D. Bullard Company
Industrial Products Company
The C. M. Kemp Mfg. Company
Walter Kidde & Co., Inc.
Mine Safety Appliances Company
National Foam System, Inc.
The Protectoseal Company
Pyrene-C-O-Two
The Surety Rubber Company
Watchemoket Optical Co., Inc.
Willson Products, Inc.
Worklon, Inc.

36.2. (No abstracts)

cf:
22.1.5
22.2.2
36.1.6

CHAPTER 37

PERFORMANCE TESTING

37.1.1. The CDIC Club presents a systematic study of low odor alkyd paints. Two alkyd resins containing 34% phthalic anhydride, glycerol, soya or safflower oil, mineral spirits or odorless thinner and octoate, naphthenate or odorless driers were processed and used as vehicle in flat white paints (12 series). Two alkyd resins containing 30% phthalic anhydride, pentaerythritol, with oils, thinners and driers as above were processed and used in similar type paints (12 series).

The paints were evaluated as follows:

1. Stability & skinning (24 hours & 6 days).
2. Air drying time by R.C.I. Type apparatus
3. Viscosity values—Stormer KU (Original & 30 days in closed cans)
4. Reduction with 10, 20 and 30% (wt) of thinner and determining Stormer KU viscosity (original & 30 days).
5. Washability and scrubbing tests
6. Absorption evaluation. TT-P-141b (442.1)
7. Sniff test—57 g paint, brushed on 4 sides and bottom of 14" X 14" X 8" cardboard box, with sniff hole 2½" in diameter, in top. Odor was examined at 1, 4, 7, 24, 96, and 168 hour intervals by laboratory staff of 10 persons for most tests. Detailed conclusions are presented. OD, 26, #358, 11/54, p. 1047

37.1.2. Hampton discusses three pieces of apparatus designed in the laboratories under his direction. These are for:

1. the laboratory testing of the wash and scrub resistance of water paint films.
2. the accurate measurement of the thickness of detached films by an optical lever method
3. the reproduction in the laboratory of the gas checking defects which are often encountered in baking finishes.

OD, 26, #359, 12/54, p. 1199

37.1.3. Talen reviews the organization of paint research in the Netherlands and some investigations by the Paint Research Institute T.N.O. Since 1930 when this Institute was formed much work has been done, including:

a. general problems in the manufacture of paints
b. methods of chemical analysis
c. methods of physical analysis
d. properties & applications of oils and resins, drying by oxidation or chemical conversion
e. properties and applications of pigments
f. properties and applications of non-oxidizable binding compounds, solvents and plasticizers

One of the important problems studied by the Institute has been the correlation between the results of laboratory and the behavior of paints in actual service. In this paper, are presented some results of this work including a comparison between actual performance and test panels, comparison of weathering tests and laboratory tests, paints with white pigments, paints with green pigments, tensile tests on varnishes, and summary. OD, 27, #360, 1/55, p. 24

37.1.4. As lacquer technology becomes more complex Shell Chemical Co. finds that unique tests are required to cope with customer problems. Shell Chemical's Union, N. J. Laboratory is reviewed. PVP, 45, #2, 2/55, p. 34

37.1.5. Werthan discusses beaded traffic line paint. A proposed method of evaluation of the degree of wettability of reflectorizing glass spheres by traffic paint is presented. ASTM, #202, 12/54, p. 59

37.1.6. The development of the salt spray test method in ASTM is highlighted by McMaster. Group studies of this method are presented to show inherent operating problems of the 20 per cent salt spray, and their solution by the adoption of a 5 per cent concentration of the salt solution. Method B 117 is shown to be unsuited to the adequate testing of most plated items, and an acetic acid version of the 5 per cent revision of Method B 117 is presented as a suitable testing medium for cadmium, zinc, and chromium platings on steel or die-castings, and for anodized aluminum and phosphated aluminum. In fact, the acetic acid version appears to be acceptable for all salt spray testing. ASTM, #203, 1/55, p. 62

37.1.7. Surface dirts and their standardized simulation on painted surfaces were studied by Shelberg, et al, in order to devise a simple immersion test to compare the ability of mildly agitated solutions to remove outdoor urban and shipboard surface dirts.

The paper describes the formation, properties, and analysis of some outdoor surface dirts; the preparation of synthetic urban and shipboard dirts and their conversion to realistic artificial surface dirts on painted test surfaces;

and a laboratory detergency test which employs the test surfaces and quantitatively measures by weighing the percentage of artificial surface dirt removed when a test surface is immersed in a cleaning solution.

Greater accuracy in evaluating cleaners for painted or other hard surfaces should be realized by using this detergency test. IEC, 46, #12, 12/54, p. 2572

37.1.8. A series of pictures shows the commonest finishing defects complete with explanations of cause and effect. This includes overspray-dry spray, sags and runs, lifting, compounding too soon, hand or finger paints, wet spots, chalking of lacquers, wrinkling, shrinking and splitting of putty, rough dirty finish, rust under film, blistering, orange peel, floating, pinholing in lacquers, shrinking and splitting of primer sealer, crazing, cracking and checking, poor adhesion. CPVM, 28, #11, 11/54, p. 22

37.1.9. Johnson discusses a number of paint failures and their causes. Sagging, peeling, staining (bleeding), blistering, uneven cure, bad adhesion, discoloration, surface specks, poor hiding are discussed. Finish difficulties on wood, problems with highly porous surfaces and inadequate primers are reviewed. CPVM, 29, #5, 5/55, p. 26

37.1.10. Blackmore reports the most important findings and conclusions resulting from a nine-year research program conducted by the Federation of Paint & Varnish Production Clubs, in which problems were investigated under stipulated conditions by a number of organizations in various parts of the U.S.A. PT, 19, #213, 6/55, p. 193

37.1.11. Nicholson & Jenkins discuss the blistering of paint films on steel surfaces. Types of blistering are described; including film-expansion blistering, corrosion blistering, and snail-track blistering. PM, 25, #8, 8/55, p. 303

37.1.12. Flournoy discusses the preliminary evaluation of protective coating systems. Preliminary tests include thickness measurement, detection of flaws and holidays in the coating, measurement of flexibility, adhesion, and hardness, and some basic chemical tests for coatings. The latter include

10% HCl at 140°F
10% NaOH at 140°F
10% $CuSO_4$ at pH 5.0, and at 140°F
Distilled water at 200°F

C, 11, #7, 7/55, p. 17

37.1.13. Greenblatt reports on what the Navy (Canada) learned about tests. Laboratory and long term exposure tests on specification Primer 1-GP-48 Type A and Primer 1-GP-48 Type A overcoated with 1-GP-61 Topcoat show that these materials are significantly better than a group of alternate composition. However, there is no correlation between laboratory and long term tests. The exposure tests hear out user experience insofar as gloss behavior goes but give no prediction of protective life on shipboard. Behavior on the racks does give an indication of the critical factors in film breakdown and this is borne out by shipboard use. CPVM, 29, #8, 8/55, p. 18

cf:
1.2.18
19.1.5
19.4.5
22.2.2
24.3.3
27.14.2
27.18.2
34.6.2
38.1.6

Manufacturers:

Conrad, Inc.
Gardner Laboratory, Inc.
The G. S. Equipment Company
Leeds & Northrup Company

37.2.1. The New York Club presents the results of its study of the significance of the tack-free test. Conclusions are as follows:

1. Test methods studied show poor reproducibility
2. There is no justification for preferring one method over another
3. Agreement among the laboratories was within the precision of the test methods.
4. Committee feels it inadvisable to suggest a method for determining tack-free time at this time.
5. It appears necessary to allow a large margin of safety when specifying a definite tack-free time. OD, 26, #358, 11/54, p. 1067

37.2.2. Richardson, et al, (New York Club) studied the significance of the tack-free test. The test methods studied showed poor reproducibility. There is no justification for preferring one method over another. In general, the agreement among the laboratories was within the precision of the test methods. The committee feels it inadvisable to suggest a method for the determination of tack-free at this time but suggest careful use and interpretation of existing methods. It appears necessary to allow a large margin of safety when specifying a definite tack-free time. POCR, 117, #25, 12/16/54, p. 16

37.3.1. The Detroit Club studied the mechanisims of film breakdown. Weatherometer studies were aimed at evaluation of

1. blistering
2. chalking and bronzing
3. color change (fading or darkening)
4. checking
5. dulling (aluminum flake paints)
6. gloss retention.

The theory of paint failure by exposure to a cycle of a relatively high concentration of ultra-violet light followed by water spray is apparently lacking in some factor which causes a more complete penetration of paint films by agents of deterioration. Until this factor is determined, investigations into mechanism of paint failures will be seriously handicapped. OD, 26, #358, 11/54, p. 1076

37.3.2. Davis describes a weatherometer machine, built by General Motors technicians, which speeds weathering by 20 times. CPVM, 29, #4, 4/55, p. 17

37.3.3. Laboratory experiments based on observations of paint deterioration in use have been carried out, by Pupil, to reproduce many conditions found to exist when paint is used for particular purposes. He gives an account of some of these investigations and points out the advantages of the method over work with test panels exposed to the atmosphere in selected localities. In particular he criticises the opinion that these exposure tests can be interpreted to give conclusions on the value of the paints concerned for a wide range of tests. PM, 24, #10, 10/54, p. 354

37.3.4. Agreement between accelerated weathering and natural

exposure tests has been obtained by Toeldte in a series of tests in which six selected paints were subjected to eight different cycles of laboratory experiments and outdoor exposure. Results are discussed in this paper. In addition paints are grouped into three groups according to the resistance to the elements, and gives an indication of the influence of each of the factors involved. PM, 24, #12, 12/54, p. 419

37.3.5. Saur studied the photochemical degradation of automobile lacquers. Experiments show that ordinary weathering is due to light, oxygen and water. A proposed deterioration mechanism accounts for these, of which the absence of any one greatly inhibits degradation. ASTM, #207, 7/55, p. 61

37.3.6. Fitzgerald has quantitatively related the physical effects of degradation in alkyd films to the conditions and chemical mechanisms that produce them. ASTM, #207, 7/55, p. 65

37.3.7. The relative exterior durability of emulsion paints of different white pigments is described, by Campbell, and the superiority of the chalk-resisting rutile-type titanium dioxide pigments is established. Most of the data relate to paints based on plasticized polyvinyl acetate emulsions, but polystyrene, styrene-futadrene and alkyd types are included.

The effect of varying pigment loading and polymer/plasticizer balance are dealt with in some detail. Mixtures of titanium dioxide with other white pigments and extenders are included. Other data relate to the effects of location of exposure, season of exposure and age of paint prior to exposure. JOCCA, 38, #9, 9/55, p. 550

37.3.8. Accelerated weathering and related studies are discussed. More rapid and natural breakdown, variation in performance, the course and nature of breakdown, pigment effects, and the use of the electron microscope are reviewed. PT, 19, #216, 9/55, p. 297

cf:
32.1.1
37.1.3
38.1.10

Manufacturers:
Atlas Electric Devices Co., Inc.

37.4. (No abstracts)

cf:
28.1.7
37.1.2

37.5. (No abstracts)

cf:
37.1.2

37.6. (No abstracts)

cf:
27.10.1

37.7.1. Pocock discusses the measurement of traffic paint abrasion with beta rays. The beta ray backscatter gage is a useful instrument with which to follow changes in paint film thickness produced by laboratory abrasion tests. Dry film thicknesses can be determined to the nearest tenth of a mil, provided the infinite thickness counting rates of the paint and the supporting medium are sufficiently different.

Calibration curves of counting rate versus thickness can be plotted empirically for any coating on any supporting medium provided only that the following conditions be fulfilled:
1. That the coating and its support have different effective atomic numbers, and 2. that the beta ray backscatter counting rate at infinite thickness for both materials be known.

The average minimum infinite thickness of 18 traffic paints investigated was 26 mils, using the Michigan gage charged with strontium 90.

Common engineering materials tend to form generic groupings when arranged by beta ray backscatter counting rates according to effective atomic numbers. Those of similar bulk specific gravities tend to form generic groupings when arranged according to beta ray backscatter counting rates. ASTM, #206, 5/55, p. 55

37.7.2. Grupp discusses the abrasion resistance characteristics of organic finishes or flying boat hulls. This is a review of tests performed by the U. S. Navy. Sixteen conclusions arrived at by this study are presented. OF, 16, #8, 8/55, p. 10

37.7.3. Roberts, et al, describe an abrasive jet method for measuring abrasion resistance of organic coatings. A jet of fine abrasive particles, under closely controlled conditions, is used to abrade through the coating to the substrate—simple, rapid, and reproducible method. ASTM, #208, 9/55, p. 36

37.8.1. Park studied the water resistance of air-dried alkyd resins. He found that the choice of polyol is not the main factor in determining the degree of water resistance of an alkyd resin. The relative water resistance of alkyd resins of the same oil length is largely dependent upon the number of unreacted or excess hydroxyl groups which are attached to the resin molecules. Certain minor but different differences have been observed among the formulations based on different polyols.

Water resistance and speed of air dry of a particular alkyd resin improves as the resin is cooked to an acid number closer to the gel, ie: as molecular weight of resin increases.

Where the oil content of the resin is greater than 50%, the resistance to water attack of air dried alkyd resins generally improves a great deal with aging of the resin film.

In resins with the same acid number at the gel point and based on glycerine or pentaerythritol mixtures, and having the same XS-OH values, the resins based on pentaerythritol mixtures show better water and soap resistance at a high acid number than do the glycerine-based resins. This advantage of pentaerythritol formulations disappears, however, as the resin is cooked to lower acid numbers. OD, 27, #365, 6/55, p. 371

37.8.2. Day studied water adsorption in polystyrene, cellulose triacetate, and polyvinyl chloride below saturation vapor pressure. PT, 19, #214, 7/55, p. 231

cf:
4.1.12
28.1.7
38.1.10

37.9.1. Waterhouse & Schulman discuss the adhesion of amphipatic molecules (surfactants) to metal surfaces. PT, 19, #213, 6/55, p. 189

37.9.2. James reports on experiments on paint adhesion under moist conditions. PT, 19, #213, 6/55, p. 192

37.9.3. Permoda & Carrick studied the adhesion of calcium-carbonate alkyd coatings on steel.

The effect of volumetric concentrations of $CaCO_3$ pigmentation on the adhesion of an alkyd coating to a steel substrate was investigated. The results show that optimum adhesion obtains at a definite pigment concentration.

The study revealed that the comparative adherometer adhesion values are not necessarily comparative when evaluating different coating systems. OD, 27, #368, 9/55, p. 653

cf:
34.1.14

Manufacturers:
Gardner Laboratory, Inc.
Universal Aviation Equipment, Inc.

37.10.1. The behavior of polyvinyl acetate emulsions on being frozen and thawed varies; some precipitate, some thicken, while others remain unchanged. Similar variations are observed after the emulsions have been converted into paints. Fletcher & Mayne provide an explanation of this precipitation and thickening. The factors influencing freeze-thaw stability are also examined and the principles governing the formulation of freeze-thaw stable emulsion paints discussed. PM, 25, #3, 3/55, p. 116

37.11.1. Long & Thompson studied water induced acceleration of the diffusion of organic vapors in polymers. The systems studied included:

Water-acetone-polyvinyl acetate
water-carbon tetrachloride-polyvinyl acetate
water-acetone-cellulose acetate (37.9% acetyls)
water-benzene-polystyrene

JPS, 14, #76, 10/54, p. 321

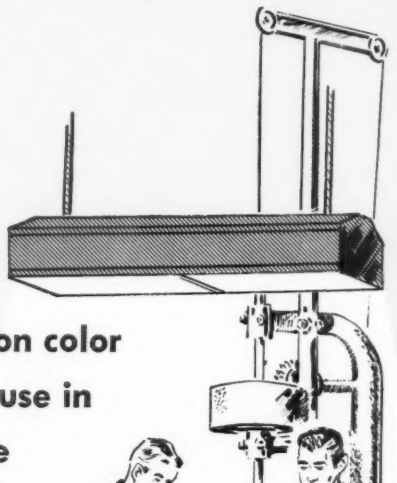
37.11.2. Long & Thompson present data on the rates of sorption and desorption of water vapor into several linear polymers with emphasis on a study of the concentration dependence of the diffusion coefficient and on the extent of agreement of the results with Fick's laws of diffusion. The polymers studied were polyvinyl acetate, cellulose acetate, cellulose nitrate, 6-10 nylon, and polyvinyl alcohol. JPS, 15, #80, 2/55, p. 413

cf:
38.1.10

37.12.1. How far will your paint go? Determining the amount of paint needed to cover a given area is simple. Shur shows how to do this by using some fundamental arithmetic principles. IR, 14, #3, Autumn 1955, p. 79

Give Your Paint Color Matching the 1-2-3

1 **Master Control for establishing formulas against customer's sample.**
.. Macbeth Color Matching Skylight



2 **Low cost production color control for tinters use in approximating the match of the batch against lab or customer's sample**
...THE MACBETH EXAMOLITE®

3 **Final check of batch back to standard**

The Macbeth Examolite is a low cost, economical unit, easily installed right where you want it. Why not call in a Macbeth engineer? Write us for more information and a Macbeth Engineering Survey Form to guide our engineers in making concrete recommendations for improving your color control.

Macbeth Daylighting Corp.
a subsidiary of the Macbeth Corp., Newburgh, N.Y.

CHAPTER 38

ANALYTICAL TESTS

38.1.1. The purpose of this paper by Purd is to attempt to acquaint the inexperienced laboratory technician with some of the more important but fundamental calculations of paint formulating, which many times, due to "second nature" are overlooked by the paint chemist or not explained properly in training young laboratory assistants. It is presented in a concise manner so as not to create confusion and in hopes that it may be used for study or as a handy reference guide when computations are to be made.

Included are bulking value, percent pigment and vehicle, pigment composition, non-volatile vehicle, volatile vehicle, pigment volume concentration, oil length of vehicle total solids, weight per gallon, and driers. APJ, 39, #31, 4/18/55, p. 102

38.1.2. La Bras & Bobalek discuss some practical techniques for recovering free paint films from a variety of substrates. The electrolytic method, the mercury amalgam technique, and a new method using an intermediate film as a stripping aid are discussed. OD, 27, #362, 3/55, p. 163

38.1.3. The projected-area method has been modified, by Pidgeon & Dodd, for direct microscopic measurement of the specific surface areas of non-porous particulate matter, such as convex, irregularly shaped, crystalline particles. The new graticule projected-area method combines the accuracy and advantages of projected-area measurements with the speed of eye-piece graticule comparison procedures. AC, 26, #11, 11/54, p. 1823

38.1.4. Shaw & Formo studied the use of n-butyl alcohol as a solvent for saponification of a representative series of drying oils. It appears from this work that n-butyl alcoholic potassium hydroxide reagent, containing 5% of water added to the reaction mixture, gives very acceptable results based upon calculated saponification values. JAOCS, 31, #11, 11/54, p. 448

38.1.5. A general method and an attenuation method for measuring the electrical conductance of buried or submerged pipe lines are proposed. Definitions, test conditions and set up, instruments, procedures, calculations, and methods of reporting results are covered. Appendix includes pertinent formulae, suggested forms for making reports. C, 11, #2, 2/55, p. 59

38.1.6. Manning discusses the evaluation of organic protective coatings covers; properties and inspection of organic finishing materials, organic finishing material specifications, inspection of film on finished parts, inspection plan for organic finishing materials and for finished parts, and summary. OF, 16, #2, 2/55, p. 7

38.1.7. Ward discusses the properties of well-defined suspensions of solids in liquid. Viscosity and sedimentation of suspensions are considered in the article. Theoretical and experimental approaches to the viscosity of suspensions are reviewed. JOCCA, 38, #1, 1/55, p. 9

38.1.8. The importance of pH as a factor in manufacturing processes, product deterioration and experimental work has been receiving increased appreciation. A particular case is emulsion paint, where stability and pigment compatibility can be affected by changes in pH. In the manufacture of pigments, too, this property can govern the fineness, covering power, shade or even color of the product. Déribéré considers these points in detail, and discusses the determination of this value and the particular difficulties which have led to the concept of the corrected pH or pHp. PM, 25, #3, 3/55, p. 101

38.1.9. Electrical and electronic apparatus is becoming of increasing importance in laboratories both for research and production control, for such diverse applications as chromatography, colorimetry, particle-size determination, pH meters, titration apparatus, and thickness gauges. PM, 25, #6, 6/55, p. 216

38.1.10. Bell, et al, studied the structure of paint films. The following are reviewed: chemical aspects (vehicle and pigment), physical aspects (vehicle and pigment), water absorption and permeability, aging and weathering, and synthetic resin latex paint films. PT, 19, #213, 6/55, p. 190

38.1.11. Stafford & Deichert review the year's developments in the analysis of coatings. AC, 27, #4, 4/55, p. 606

38.1.12. Two experimental procedures were used by Horton & Rogers to measure the effect of elastic strains on the dielectric constants of polystyrene and Lucite. $C = 6 \times 10^{-12}$ Cm.^{2}/dyne was obtained for both. JPS, 17, #84, 6/55, p. 191

38.1.13. United States Testing Company, Inc. issued 112-page compilation of Tables and Data.

cf:
8.6.1
13.1.4
18.7.2
21.1.7
21.14.1
22.1.3
22.1.4
22.1.6

22.2.2
23.1.28
24.5.4
25.3.5
27.12.2
32.2.2
34.6.2

Manufacturers:
Charles E. Barker Company
Gardner Laboratory, Inc.
Macbeth Corp. & Subsidiaries
The Perkin-Elmer Corporation

38.2.1. The Los Angeles Club presents the results of work on the calibration of the Sward Rocker. Conclusions drawn are as follows:

1. While the readings obtainable with a Sward Rocker will vary with atmospheric pressure, differences between different Sward Rockers overshadow this variation.
2. The radius of curvature of the runners affect the hardness readings obtained. But the effect can be neglected as long as the radius of curvature does not approach a "V" shape or a flat shape.
3. The method of calibration should be modified as suggested in the paper.

OD, 26, #358, 11/54, p. 1030

38.2.2. Jones, et al, (Los Angeles Club) discuss the calibration of the Sward Hardness Rocker Tester. Includes: introduction, the rocker, experimental, discussion of results —effects of air pressure variations, effects of runner shape, use of plastic panels in calibration, and conclusions. POCR, 117, #24, 12/2/54, p. 84

38.3.1. Dimmick discusses the factors in the application of the color aptitude test. A study was undertaken to obtain a picture of the performance that may be expected. It includes the distribution of scores from a population of 700 subjects; the measure of test-retest variability among 200 subjects; and preliminary studies of the effects of special factors on the scores. This work has aimed at studying the typical distribution of scores in a large population, evaluating scores at certain levels, determining inherent variability of matchers in general, and in individual cases, and examining criteria that have been used casually to evaluate color matchers. OD, 26, #359, 12/54, p. 1265

38.3.2. Hancock and Watt describe development of methods for determination of color of petroleum products by the ASTM Committee D-2 on Petroleum Products. The difficulties encountered in attempting to revise and standardize poorly conceived methods is illustrated. The Union Colorimeter method and photoelectric methods are discussed and a table of present and proposed specifications for glass color standards is included. ASTM, #201, 10/54, p. 31

38.3.3. Ingle discusses a color space for color grading purposes. Grading of the yellowness of many transparent materials is an important measure of quality. To overcome many inaccuracies and limitations of existing methods, a technique is proposed which applies recent data concerned with perceptible color differences. ASTM, #201, 10/54, p. 36

38.3.4. Scofield discusses colors of transparent liquids for surface coatings. While satisfactory single-number standards are available and can be improved, basic psychophysical research is needed for significant measurement improvements in this field. ASTM, #202, 12/54, p. 68

38.3.5. Goodwin reviews the measurement and specification of color and small color differences. An international method of color identification known as the CIE (Commission Internationale d'Eclairage) System offers a means of quantitative color measurement as opposed to the qualitative color evaluations which have been used in the past. The color measurements are permanent and reproducible. They are made without involving human judgment, but they can be related to human experience.

Three dimensions are used to describe color: dominant wavelength, lightness, and purity. Dominant wavelength indicates whether a color is red, blue, etc. Lightness indicates whether a color is light or dark. Purity indicates whether a color is weak or strong.

Recent development of an integrator for calculating CIE data has made it possible to make these determinations economically and on a routine basis. CIE data have been applied successfully on a commercial basis to problems of color specifications and control. The CIE color data are a strong tool in the hands of both the inexperienced and experienced worker for the measurement and evaluation of color. MP, 32, #10, 6/55, p. 143

38.3.6. Cox describes the application of flame photometry and spectrophotometry to analytical paint control. Examples are given for the analysis of calcium driers, ferric oxides, and manganese in varnishes. Colorimetry and ultraviolet spectrophotometry are discussed briefly. CPVM, 29, #4, 4/55, p. 10

38.3.7. Jolly discusses the selection of color matchers and introduces the "Colour Aptitude Test of the Inter-Society Colour Council." (England). JOCCA, 37, #414, 12/54, p. 666

38.3.8. Kredenster discusses why paint colors vary. To start with the eye is an imperfect mechanism. Added to this are problems of varying light conditions and inconsistent chemical relations. CPVM, 29, #9, 9/55, p. 23

38.3.9. Stein & Keane discuss the experimental procedure used to study the scattering of light from thin polymer films. JPS, 17, #83, 5/55, p. 21

cf:
4.1.11
21.14.2
27.7.5
34.1.14

Manufacturers:
Bauch & Lomb Optical Company
Crown Engineering & Sales Company
Fisher Scientific Company
Gardner Laboratory, Inc.
Macbeth Corp. & Subsidiaries
Photovolt Corp.
Ultrasonic Engineering Company

38.4.1. Marshall discusses the measuring of viscosity of thermosetting resins by parallel plate plastometry. This is a method for measuring viscosity of thermosetting resins at hardening temperatures, applicable to Newtonian fluids over the range from 10 to 10^7 poises, capable of following rapid viscosity changes which accompany thermal hardening-application to two-stage and resol phenolic, epoxy, urea, and polysiloxane thermosetting resins. ASTM, #204, 2/55, p. 40

38.4.2. Factors that must be considered in measuring the melt viscosity of polymers are discussed by Karam, et al. A description of a proposed rheometer to meet these requirements is given. This rheometer can be operated at temperatures and shear rates com-

parable to those found during injection molding and extrusion. Methods of plotting and interpreting the data are presented. The use of the Caplastometer for evaluating and studying the flow behavior of linear polymers is described. MP, 32, #7, 3/55, p. 129

38.4.3. Garn & Campbell describe a ball and cup absolute microviscometer designed originally for testing lubricants in the shop. The results show that this viscometer is capable of reasonable accuracy and precision when used with either an inversion or a balance technique. The drop or pull-up time is proportional to the absolute viscosity. The sample may be as little as o.035 ml. This viscometer permits quick and convenient determination of viscosity using a very small sample and permitting complete recovery of the sample. The standard deviation of a set of data is generally less than 2%. AC, 26, #10, 10/54, p. 1609

38.4.4. Quarendon, in the first of a series of articles on thixotropy, considers the meaning of the term and discusses the fundamental aspects of the phenomenon, including yield value and flocculation. PM, 25, #1, 1/55, p. 5

38.4.5. The influence of particle shape and size, and the study of the phenomenon by means of electrical measurements are discussed, by Quarendon, in this second part of his article on thixotropy and paints. PM, 25, #3, 3/55, p. 106

38.4.6. The information available on the formulation of thixotropic paints is discussed by Quarendon, in this third part of the article on thixotropy and paints. He also considers the properties of these materials and some of the factors influencing thixotropy such as surface-active agents. PM, 25, #5, 5/55, p. 173

38.4.7. Richardson describes a thixoviscometer suitable for use in production control. The construction, cleaning, calibration, operation, and results obtained with this instrument are described. PT, 18, #205, 10/54, p. 47

38.4.8. Brunt studied the linear visco-elastic behavior of paint films as a function of time and temperature. PT, 19, #213, 6/55, p. 191

38.4.9. Jobling discusses recent developments in the mechanical testing of materials. PT, 19, #214, 7/55, p. 228

38.4.10. The work which has been undertaken on the evaluation of thixotropy and the instruments used in these experiments are considered by Quarendon in this fourth part of the series of articles on "Thixotropy and Paints." PM, 25, #8, 8/55, p. 297

38.4.11. Barber, et al, present information on the design, construction, and typical operation of a rotational viscometer for operation at shear rates up to about 1,000,000 reciprical seconds. AC, 27, #3, p. 425

38.4.12. The Vand & Brailey equations relating the viscosity of suspensions in Newtonian liquids with the concentration of pigment present have been employed, by Asbeck, et al, in practical viscosity measurements of paint systems.

A prediction of the viscosity of any concentration of pigment in a given Newtonian vehicle may be made for any chosen high shear velocity by combining the equations with a second empirical hyperbolic equation, correlating the structure of pigmented systems with concentration of pigment. IEC, 47, #7, 7/55, p. 1472

38.4.13. The industrial finisher who overlooks viscosity control is wasting money. Johnson discusses the need for viscosity control, and reviews various methods for measuring viscosity. CPVM, 29, #9, 9/55, p. 20

38.4.14. Cleverdon & Smith studied solvent independent parameters in the viscometry of polymer solutions. Evidence is discussed for and against the existence of a common melting point when linear plots of η sp/C against C for polystyrene in a number of solvents are extrapolated to negative concentrations. JPS, 14, #76, 10/54, p. 375

38.4.15. Eisenberg & Frei describe a precision rotation viscometer with electrostatic restoring torque for the centipoise range. JPS, 14, #77, 11/54, p. 417

38.4.16. Kooy & Hermans discuss precision viscometry of polymer solutions. They describe a method for measuring times of efflux in a capillary viscometer with an accuaracy of 0.003 sec. JPS, 16, #82, 4/55, p. 417

38.4.17. Hart describes an accurate semimicro capillary viscometer in which dilutions can be made. Techniques for semimicro work are described and specifications are given for an instrument suitable for intrinsic viscosity determinations with 1 milliliter of solution. JPS, 17, #84, 6/55, p. 207

38.4.18. Hart presents a graphic method for a single-point determination of intrinsic viscosity. For a given polymer-good-solvent system at a fixed temperature, the product of intrinsic viscosity and concentration is a unique function of specific viscosity alone up to high values of specific viscosity. This permits a single parametric curve to be drawn from experimental data; thereafter, accurate calculation of intrinsic viscosity from the results of a single specific viscosity measurement becomes possible with the aid of a convenient equation. JPS, 17, #84, 6/55, p. 215

38.4.19. A testing device of the character described comprising a cylindrical vessel for holding a test liquid and providing a surface for a test film thereof above the liquid level, means for rotating said vessel, a bristled brush assembly comprising a plurality of radially arranged brushes, means including a shaft for mounting said brush assembly axially within said vessel in brushing contact with the interior surface thereof with substantially no vertical load, a lever having a fulcrum, a counterweight carrier by said lever, a scale cooperable with said counterweight, and means operatively connecting said shaft with said lever to rock the lever when said shaft is rotated, said counterweight being adjustable and cooperable with said scale to counterbalance the force tending to rotate the shaft and to indicate the degree of said force. USP 2,712,235

cf:
16.1.25
28.1.7

Manufacturers:

Brookfield Engineering Labs., Inc.
Burrell Corp.
Drage Products
Gardner Laboratory, Inc.
General Electric Company
Hellige, Inc.
Norcross Corp.
Ultrasonic Engineering Company
Universal Aviation Equipment ,Inc.

38.5.1. Kaufman, et al, discuss the determination of apparent

molecular weight of polychlorotrifluoroethylene. Until recently, three methods were available: the no strength temperature, flow index, and solution viscosity. All three have shortcomings. In order to eliminate all of the objections to the three mentioned methods, a fourth method, the zero strength time test, was developed. This method and apparatus are discussed. MP, 32, #2, 10/54, p. 146

38.5.2. Cragg studied the choice of solvent for the viscometric determination of molecular weights of high polymers. Because the advantages seem to outweigh considerably the disadvantages, the use of an "ideal" solvent should be given careful consideration, particularly when the molecular weights are very high or cover a wide range. JPS, 13, #68, 2/54, p. 167

38.5.3. In the polymerization of dienes, the crosslinking reaction can be expected to have a marked influence on the molecular weight distribution, leading finally to the formation of insoluble polymer networks. It should have a relatively small effect on the number-average molecular weight, but a large effect on the weight-average molecular weight.

Studies, by Morton, on the emulsion polymerization of butadiene, isoprene, and chloroprene have confirmed this hypothesis. The number-average molecular weights agree fairly well with those predicted from the kinetics of the system and depend largely on the initiator and/or modified used. However, the .viscosity average molecular weights are dependent largely on the extent of the crosslinking reaction. Thus, isoprene has a much smaller crosslinking rate during polymerization than butadiene, while chloroprene shows a higher rate.

These differences in crosslinking are reflected in the Mv/Mn ratio of the three polymers. Instead of the theoretical value of 2 to 3 to be expected in the absence of crosslinking, the actual values rise as high as 20, depending on the monomer used and the polymerization temperature. The onset of gelatin is governed by both molecular weight and crosslinking rate, and is therefore a function of the initiator-modifier system, the polymerization-temperature, and the particular diene. IEC, 47, #2, 2/55, p. 333

38.5.4. Mastrangelo, et al, have developed a method for evaluating the reliability of routine molecular weights determined by light scattering. It consists of correlating, a) the molecular weight of the low 10% molecular weight fraction against the volume per volume percent of methanol necessary to precipitate 91.0% of the clinical dextran (used in this study) fraction, and b) log (n) against the weight average molecular weight of the whole clinical fraction. AC, 27, #2, 2/55, p. 262

38.5.5. Parrette discusses an isopiestic method for determining molecular weights of polymers. Results show that it is reliable for molecular weights up to 40,000. The accuracy decreases rapidly with higher molecular weights. JPS, 15, #80, 2/55, p. 447

38.5.6. Chinai, et al, obtained a viscosity-weight average molecular weight relationship for fractionated polyvinyl acetate in a thermodynamically "good" solvent acetone at 30° C. This relationship is represented by: $[\eta] = 8.6 \times 10^{-5} M_w^{0.74}$. JPS, 17, #83, 5/55, p. 117

38.5.7. Additional polyvinylpyrrolidone samples of great homogeneity were prepared, by Levy & Frank, and their intrinsic viscosity and molecular weight (by light scattering) have been determined in water and chloroform. In view of the new results the previous data were reinterpreted. All data were evaluated by objective statistical techniques and revised intrinsic-viscosity molecular weight questions are proposed. JPS, 17, #84, 6/55, p. 247

38.5.8. Valentine studied the effect of the loss of low molecular weight polymers on molecular weight averages. JPS, 17, #84, 6/55, p. 263

38.6.1. This paper, by Li, presents three additional nomographs for evaluating the significance of attributive test results on two equal-size samples. These graphs cover sample sizes from 80 to 100,000. ASTM, #205, 4/55, p. 46

38.6.2. Lark discusses the application of statistical analysis to analytical data. The principle of least squares provides a means of separating and estimating the systematic and random errors in determinations by an analytical method if it is investigated over a sufficient range of concentrations. The method of obtaining the estimates of error and interpreting them depends on the adoption of the two types of error to the amount of substance being assayed. Unless this is done, tests of significance or statements involving probability may not be made. In the extended treatment of an example the necessary steps in a statistical examination—choice of hypothesis, computation of regression equations and associated errors, and testing for rejection of suspected values—are illustrated. The results of such an examination are applied to the prediction of the true amount of substance in a sample from that found by chemical analysis. AC, 26, #1, 11/54, p. 1712

38.6.3. Statistical procedures help to solve an ever-widening range of problems. This article, by Reid, discusses some of the basic concepts of industrial statistics. IR, 14, #2, Summer '55, p. 47

cf:
26.2.4
34.6.1

38.7.1. A semimicroprocedure, by Pohl, for the rapid determination of carboxyl end groups of the polyester, polyethylene, terephthalate, entails dissolving the polymer in benzyl alcohol rapidly at a high temp. (203° C) then quickly mixing the solution with chloroform, and titrating with the aid of phenol red indicator and sodium hydroxide. About 10 minutes is required for an analysis, including weighing. An additional 5 or 10 minutes may be required if the polymer sample needs grinding. To aid precise dispensing of the reagents, a new and simple automatic pipet or buret is used. AC, 26, #10, 10/54, p. 1614

38.7.2. Jordan has developed a rapid method, which uses only standard laboratory equipment, for qualitatively detecting vicinal glycols of low molecular weight in alkyd resins. It is based on reflux distillation, making use of a ternary azeotropic mixture formed by xylene, the glycols, and water, xylene being the refluxing medium. AC, 26, #10, 10/54, p. 1657

38.7.3. The titration of weak acids in non-aqueous media has

become an active field of investigation in recent years, and is being widely applied in the determination of phenols in resins, tars, coal hydrogenation products, and similar materials. In the present work, by Glenn & Peake, the scope of acid-base titrations in ethylenediamine has been extended to include phenolic esters. AC, 27, #2, 2/55, p. 205

38.7.4. Hirt, et al, have developed an ultraviolet spectrophotometric method for the rapid determination of polymerized styrene in styrenated fatty acids and alkyd resins, which makes corrections for the overlapping absorption of conjugated triene fatty acids and residual monomeric styrene. The method as tested on a variety of styrenated fatty acids is superior in both speed and accuracy to the chemical method based on saponification value. AC, 27, #2, 2/55, p. 226

38.7.5. A previous investigation had revealed a large error as between operators in the determination of non-volatiles content of paint media by an oven-heating method. Further work has shown that this error arises between laboratories and is probably due to differences between equipment used. There is no significant error between operators or from day to day in the same laboratory. JOCCA, 38, #7, 7/55, p. 362

38.7.6. Garetto & Ruffoni have established a gravimetric method for the determination of the percent of combined acetic acid content of acetone-soluble cellulose acetate. Results compare favorably with those obtainable by the usual volumetric methods. AC, 27, #3, 3/55, p. 400

38.7.7. Pepe, et al, studied methyl isopropenyl ketone polymers. To correlate physical test data of these polymers with their chemical composition, the methyl isopropenyl ketone content was determined by ultraviolet spectroscopy. This method is based upon the law absorptivity of polybutadiene and butadiene-acrylonitrile copolymers on the absorption maximum for methyl isopropenyl ketone polymers in chloroform. AC, 27, #5, 5/55, p. 755

38.7.8. Lacquers containing nitrocellulose, alkyd resins, and plasticizers such as esters of phthalic or phosphoric acid are used as protective coatings for automotive equipment and other ordnance applications. New methods have been developed (by Swann, et al) for solvent separation of nitrocellulose, direct spectrophotometric determination of total phthalate, separation and analysis of phthalate ester plasticizers by charcoal adsorption, and nonvolatile and phosphate ester determinations. AC, 27, #9, 9/55, p. 1426

38.7.9. Davidsohn discusses a simplified method for the analysis of alkyd resins. PT, 19, #216, 9/55, p. 301

cf:
5.4.3

38.8.1. O'Connor & Goldblatt studied the correlation of ultraviolet and infrared spectra of terpene hydrocarbons. Various types of structures of terpene hydrocarbons are readily distinguished by their ultra-violet spectra. In some cases established rules of ultraviolet absorption, coupled with a limited number of physical characteristics, permit positive identification of a known terpene or provide a direct guide to the structure of an unknown terpene.

In the "group frequency" region of the infrared (2-9 microns) presence of groups can be ascertained. The "fingerprint" region (9-12 microns) is characteristic of each type of molecule.

Individual terpene hydrocarbons can be identified by direct comparison of their spectra in this region with spectra of standard reference compounds. The combination of ultraviolet and infrared spectra may be used to identify and determine the terpene hydrocarbons in various distillate fractions, especially those derived from turpentine. AC, 26, #11, 11/54, p. 1726

38.8.2. Binder developed an accurate method for determining the microstructures of polybutadienes and butadiene-styrene copolymers enabling the study of the effects of polymerization variables. This method may be extended to other diene copolymers. AC, 26, #12, 12/54, p. 1877

38.8.3. In order to isolate the possible contributions of ionizing groups to the infrared spectra of natural and synthetic polymeric electroytes in aqueous solutions, the absorption spectra of D_2O solutions of polymethacrylic acid, as well as of copolymers of methacrylic acid and 2-dimethylaminoethyl methacrylate, and of acrylic acid with 2-vinylpyridine, have been recorded by Ehrlich in the region from 5-8 μ accessible to transmission measurements.

The spectra show strong bands due to the carboxyl group (at 5.85μ) and the carboxylate ion (at 6.45 and 7.08μ), and, for the copolymer of acrylic acid and 2-vinylpyridine, those characteristic of the pyridine ring; the addition of a deuterion to the basic nitrogen in DCl solution changes the spectrum, displacing the absorption bands of the pyridine ring to lower wave lengths. From measurements of the intensity of the carboxylate absorption bands it appears that at the isoionic point the synthetic polymeric ampholytes exist as dipolar ions in solution, but that in films they carry a much smaller charge. The insolubility of polyampholytes existing as dipolar ions at the isoionic point indicates that a minimum number of ionized groups must be present on a polymer molecule in order to ensure the stability of a binary solution in water. JACS, 76, #21, 11/5/54, p. 5263

38.8.4. The present state of knowledge regarding the structure of oils and resins, including some treated oils and synthetic resins, is reviewed by Ahlers & O'Neill. Problems still outstanding and their technical significance are indicated, and the possibility of solving them by newly developed techniques is discussed. The most important newer technique—absorption spectroscopy—is considered in detail. JOCCA, 37, #412, 10/54, p. 38.8.4

38.8.5. Hirt, et al, show how unsaturated polyester formulations, consisting of polymeric esters of dihydric alcohols and dibasic acids dissolved in a vinyl monomer such as styrene, may be analyzed spectrophotometrically without prior chemical treatment or separation. The method can be of value in the rapid checking of formulations against established specifications. AC, 27, #3, 3/55, p. 354

38.8.6. Cox reviews the application of flame photometry and spec-

trophotometry in paint analysis and control. PVP, 45, #9, 8/55, p. 30

38.8.7. Dudenbostel and Priestley review mass spectrometry, a modern industrial tool. The wide range of usefulness and ability to analyze complex mixtures rapidly and accurately are major factors which have given it its prominent place in science and industry. CEN, 32, #48, 11/29/54, p. 4736

cf:
11.1.2
24.10.3
32.2.24
38.7.7
Manufacturers:
Baird Associates, Inc.
The Perkin-Elmer Corporation

38.9.1. Palen describes how the electron microscope works, and how it can be applied to the study of numerous problems. CPVM, 28, #9, 9/54, p. 50

cf:
21.2.2

38.10.1. The particle size of a polystyrene dispersion has been determined, by Billmeyer, by a light scattering method in which transmission measurements are made as a function of wave length. The data are extrapolated to infinite wave length, where the usual small particle light scattering treatment is valid. The results are in satisfactory agreement with the size determined by other light scattering methods. JACS, 76, #18, 9/20/54, p. 4636

38.10.2. Instruments available for measurement of specific surface by air permeability have been generally utilized for materials in the subsieve range. This work, by Dubrow and Nieradka, extends the range of air permeability measurements to sieve-size powders. An instrument which employs a sensitive adjustable flowmeter was developed. The accuracy and precision of the method indicate that the instrument can readily be adopted for rapid routine measurements of specific surface or average particle size in the range investigated. AC, 27, #2, 2/55, p. 302

38.10.3. Rose examines the results of experiments relating to the reflectivity of mixtures of powders and the theoretical basis of the tinting strength method of specific surface determinations is considered. The tinting strength method, though not strictly valid, is sufficiently accurate for practical purposes with certain limitations. The tinting strength method of test probably gives direct information as to the aggregation properties of powders rather than to size characteristics. Certain observations as to a relationship between the particle size and the reflectivity of a powder are given, and it appears that this relationship might form the basis of a simple test for the particle size of materials within the size range under consideration. PM, 24, #11, 11/54, p. 377

cf:
34.1.14

Manufacturers:
Gardner Laboratory, Inc.

38.11.1. Quality, cost, beauty and effectiveness are affected by film thickness. Johnson presents a rundown on some of the gauges for measuring film thickness. CPVM, 28, #12, 12/54, p. 5

38.12.1. Bunn studied the melting points of chain polymers. The molecular characteristics which determine the melting points of high polymer crystals are considered. It is shown that the properties of monomeric crystals often throw light on those of the polymers. The principal factors controlling melting points appear to be molar cohesion energy, molecular flexibility, and molecular shape effects. JPS, 16, #82, 4/55, p. 323

Manufacturers:
William J. Hacker & Co., Inc.

SUBJECT INDEX

A

Abrasion resistance characteristics of organic finishes on flying boat hulls—37.7.2
Abrasion resistance of organic coatings, abrasive jet method—37.7.3
Abrasives, their use in surface preparation—29.1.6
Absenteeism reduction builds profits—1.3.3
Absorption and swelling by nitrocellulose in binary solvent-hexane mixtures—5.2.4
Absorption-extrapolation light scattering method—38.10.1
Accelerated weathering and related studies—37.3.8
Accelerated weathering under various conditions—37.3.4
Accidents, figuring the cost of—36.1.9
Acetone as a selective solvent for vegetable oils—23.1.24
Acetylene polymers, preparation, physical properties, infrared and ultraviolet spectra—25.7.4
Acid acceleration of epoxide condensations—6.1.12
Acid-base reactions in non-dissociating solvents—22.1.14
Acrylic copolymer emulsions—19.2.1
Acrylic monomers in coating vehicles—3.1.2, 25.7.7, 25.7.8
Acrylics—3.1.1
Acrylics and PVAc for water paints—28.1.4
Adherometer adhesion of calcium-carbonate alkyd coatings on steel—37.9.3
Adhesion of amphipathic molecules to metal surfaces—37.9.1
Adhesive bonded metal joints—27.13.4
Adhesive bonding—27.13.2
Adsorption of ionic surfactants and their gegenions at the air-water interface of aqueous solutions—24.5.3
Adsorption of surface-active agents at solid-liquid interfaces—24.5.6
Aerosol paint formulation—30.3.3
Aerosol paints and lacquers—30.3.1
Aging stability of neoprene latex—19.8.1
Aircraft finishes, application—30.1.13
Air-drying oil-modified alkyd resins—4.1.14
Alkyd and epoxy resins in the coatings industry—4.1.1
Alkyd films, photooxidative degradation—37.3.6
Alkyd resin formulation nomograph—4.1.2
Alkyd resins, how water-resistant are they?—4.1.12
Alkyd resins in the paint and varnish industry—4.1.9
Alkyds—4.1.7
Alkyl amates as plasticizers of elastomers—20.2.3
Alkyl phthalate esters, polarographic behavior—20.2.4
Allylic silicon compounds, reactions of—16.1.10
Aluminum alcoholates—24.1.2
Aluminum paint, nonflaking heat resistant—26.1.4
Aluminum pigment, rust inhibitive—21.10.1
Amateur painter, what he wants to know—34.4.4
American contributions to phthalocyanine technology—21.1.4
Amine-cured finishes based on epoxide resins—6.4.1
Amines as activators for polymerization of butadiene and acrylonitrile in emulsion—32.2.14
Amino resins—9.1.1
Analysis of cellulose acetate butyrate—5.4.3
Analysis of lacquers containing nitrocellulose, alkyd resins, and phthalate-type plasticizers—38.7.8
Analysis of mixtures of surface-active agents—24.5.4
Anti-blooming compound—24.1.5
Anti-corrosive value of paints—27.3.13
Application of engineering fundamentals to vehicle manufacture—33.1.2
Applications of fatty acids and derivatives in alkyds and other polyester coating resins—23.11.5
Applications of fatty acids in metallic soaps—24.4.3
Are you fit to be an executive?—1.3.1
Are you quality control conscious—in the lab—on the test racks?—34.6.2
Aspects of polyvinyl acetate emulsion paints—19.4.7
Aspects of the development and evaluations of vinyl polymer emulsions—19.1.6
Asphalt emulsions as protective coatings—19.14.1
Asphalt penetration test, field reproducibility of—8.6.1
ASTM Committee D-1 and Navy paints—27.1.10
Atmospheric pollution control—34.7.1
Automobile lacquers, photochemical degradation of—37.3.5
Autoxidation—32.3.1
Autoxidation and oxidative polymerization—32.2.8
Azo pigment—21.5.4

B

Baffles increase mixing action—34.2.3
Benefits from paint power—1.5.5
Better storeroom layout boosts profits—35.1.2
Better understanding of the structure of bodied oils—23.1.1
Bhilawan shell liquid—23.1.12
Bhilawan nut shell oil—23.1.10
Bicycle finishing by dip—30.5.1
Big plus value in selling finishes—1.5.6
Bis-type modifiers in polymerization—32.2.23, 32.2.25
Bodied oils, toward a better understanding of the structure of—23.1.3
Brush up on rollers—30.4.3
Buffing composition—29.1.16
Bulk handling, better design for—35.1.6
Buna N-phenolic blends, semiquantitative analysis by infrared spectra of their pyrolyzates—11.1.2
Business organization types—1.4.4
Butyl titanate heat and corrosion resistant paints—27.3.12

C

Calibration of the Sward rocker—38.2.1
Cans for the paint industry—34.4.5
Caplastometer, a new melt viscometer—38.4.2
Casein monomers and polymers—9.1.4
Casein stabilizers for latex paints—24.8.1
Cashew nut shell liquid—23.1.11
Casting resins containing polystyrene—14.1.2
Catalysis of linseed oil drying, electronic explanation—24.2.3
Cellulose acetate butyrate—5.4.2
Cellulose acetate composition—5.3.6
Cellulose acetate, determination of combined acetic acid content—38.7.6
Cellulosics—5.1.1
Centrifugal pumps, rating in use—35.2.3
Centrifugals—34.5.2
Chain transfer constant of polymethyl methacrylate in the polymerization of methyl methacrylate and styrene—3.1.10
Chain transfer in solution polymerization—18.2.3
Chain transfer in the hydroperoxide initiated polymerization of styrene—32.2.7
Chain transfer in the polymerization of methyl methacrylate—32.2.19
Changes in your market—1.5.7
Chemical feeding and proportioning equipment—35.2.1
Chemical reactions in the making of cellulose acetate—5.3.1
Chemical stress-relaxation of polydimethysiloxane elastomers -16.1.14
Chemical treatment—29.1.14
Chemical utilization of fats and oils—20.1.5
Chemicals in paint industry—24.1.3
Chlorinated rubber—7.2.1
Choice of solvents for the viscometric determination of molecular weights of high polymers—38.5.2
Chrysler modernizes paint system at automotive body plant—30.1.16
Cleaning and finishing practice for phosphated zinc-coated sheets—30.1.18
Coating composition—27.1.20, 27.1.21
Coating containers—27.3.17
Coating glass—27.1.23
Coating pipelines in place internally with plastics—27.3.3
Coating polyethylene—27.16.3
Coatings, Cellulose—27.1.18
Coatings from the furans—27.3.8
Coatings of polyamide and epoxy resin blends—27.1.2
Coatings, reflecting—27.1.16
Coatings, review of—38.1.11
Cold check test and performance of furniture lacquers——27.10.1
Cold solvent degreasing—29.1.4
Color characteristics and chemical analysis of oil from frost- and weather-damaged soybeans—23.5.3
Color constitution and properties—21.14.2
Color forecast for 1955—1.2.7
Color of petroleum products, determination—38.3.2
Color, paint, and plastics—27.16.1
Color space for color grading purposes—38.3.3
Color trends—1.2.21
Coloring the fluorocarbons—21.1.2
Colors for polyesters—21.1.3
Colors of transparent liquids for surface coatings—38.3.4
Composition of paraffin waxes by mass spectrometer analysis—24.10.3
Compounding principles of silicone rubbers—16.1.7
Compressed air in the workshop—30.2.10
Condensation of resorcinol and m-cresol with tung oil—32.2.1
Continued advances characterize the organic finishing industry—1.2.28
Contractor looks at paint—1.2.2
Control of putty manufacture—34.2.2
Convection ovens for stoving—31.1.1
Conveyor dip painting glass fishing rods—30.5.5
Conveyorized packaging at Foy paint company—34.4.6
Coordinating technical departments with production and sales—1.2.1
Copolymerization of alkyd silicones for coatings—4.3.1
Copolymerization of butadiene and styrene—32.2.15
Copolymerization of 1,3-butadiene with some polynuclear aromatic hydrocarbons—25.7.3
Copolymerization of styrene and drying oils—23.1.30
Copolymers, polybutene & butadiene-styrene, analysis by infrared spectroscopy—38.8.2
Copper-phthalocyanine—21.8.3
Corrosion—27.3.19
Corrosion and protective coatings—27.3.16
Corrosion aspects of air pollution—27.3.20
Corrosion resistant coatings on metal structures—27.3.18
Corrosion resistant paints—27.3.6
Correlation of roll mill variables, floating roll mill, correlation of floating roll mill variables—34.3.9
Correlation of ultraviolet and infrared spectra of terpene hydrocarbons—38.8.1
Cost data, finding—34.1.9
Cost data, more help in finding—34.1.10
Cost estimate on technical vinyl stearate—25.7.10
Crackle Finish—27.21.1
Creative imagination as it applies to the decorative and protective coatings industry—1.2.3
Critical pigment volume concentration studies of PVAc dispersions—19.4.3
Critical properties and vapor pressures of some ketones——22.4.2
Critical review of the paint brush situation—30.6.2
Cross-termination in copolymerization—32.2.26
Crystal structure of nylon 6—12.1.6
Crystalline organosilsesquioxanes—16.1.21
Curing of silicones with aluminum crotonate—24.16.1
Cut pump specification work with standard data sheet—35.2.2
Cyclic end groups in polyamide resins—12.1.2

D

Daylight fluorescent colors—21.11.1
Decay of timber and its prevention—27.18.2
Decorative and protective coatings of "Hypalon"—13.3.1
Determination of apparent molecular weight of polychlorotrifluoroethylene—38.5.1
Determination of carboxyl end groups in a polyester—38.7.1
Determination of crystallinity in polyethylene by X-ray diffractometer—13.1.4
Determination of molecular weight of polyvinylpyrrolidone—38.5.7
Determination of specific surface of fine powders by the tinting strength method—38.10.3
Determination of the non-volatiles content of paint media—38.7.5
Development of automotive touch-up paint—27.6.2
Development of exterior coatings for wood—26.4.4
Development of shipbottom coatings—27.19.1
Developments in the painting of railway rolling stock—30.1.1, 30.1.2

Dibasic acids—25.2.3
Dielectric constant-strain coefficient of polystyrene and Lucite at 3.2 centimeters—38.1.12
Diene-type elastomers, evaluation of—8.1.1
Diffusion of water vapor in polymers—37.11.2
Dip coating, the answer for you?—30.5.3
Direct esterification of phenols with higher fatty acids—32.1.3
Dispersible asphaltic composition—8.6.3
Dissociation of weak polymeric acids and bases—2.1.4
Dissymmetry of molecular light scattering in polymethyl methacrylates—3.1.7
Distilled dehydrated castor oil fatty acids—23.11.10
Driers in paints and varnishes—24.2.1
Drying ink on polyethylene film—27.11.2
Drying oil oxidation mechanism, film formation, and degradation—32.3.3
Drying oil technology—23.1.5, 23.1.6, 23.1.8, 23.1.15, 23.1.16
Drying oils—23.1.28
Drying of lacquers on metal bodies—31.1.5
Dyes, coulometric titration with externally generated titanous ion—21.14.1

E

Economics of the paint and varnish industry—1.2.31, 1.2.32, 1.2.33
Effect of agitation on selectivity in the hydrogenation of soybean oil—23.5.2
Effect of amine accelerators on the polymerization of methyl methacrylate with benzoyl peroxide—32.2.27
Effect of chromic and chromic-phosphoric acid rinse solutions on the durability of paint coatings—29.2.2
Effect of detergent on the polymerization of allyl acetate—17.2.1
Effect of kaolinite particle size and PVA on important properties of various paint systems—21.3.4, 21.3.6
Effect of loss of low molecular weight polymers on molecular weight averages—38.5.8
Effect of various extenders in alkyd flat finishes—21.3.1
Effective use of a technical library—1.2.29
Effects of temperature and degree of polymerization on sorption of water by polymethyl methacrylate—3.1.3
Efficiency of chromate pigments as anti-corrosion agents—21.12.2
Efficiency of initiation by cumyloxy and sulfoxy radicals in free radical polymerization—32.2.17
Electrical & chemical effects of β -radiation in polystyrene—14.1.4
Electrical conductance of coating on buried pipe, method for measuring—38.1.5
Electroformed masks cut time in spray decoration—30.2.6
Electrolytic descaling—29.1.1
Electron microscope operation—38.9.1
Electronics in paint testing—38.1.9
Electrostatic spray at CGE plant—30.2.4
Employer-employee relationship—1.3.8
Emulsified chlorinated natural rubber for water thinnable paints—19.5.1
Emulsion polydienes, molecular weights of—38.5.3
Emulsion polymerization by continuous feed of reactants—32.2.4
Emulsion-polymerized polysulfone resins—8.1.4
Emulsions—19.1.3
Emulsions, flat alkyds and some new raw materials—2.1.7
Emulsions of polymeric materials—19.1.4
Epikote esters—6.2.1
Epikote resins—6.1.2
Epon resin finishes—6.1.11
Epoxide esters—6.2.5
Epoxide resins—6.1.13, 6.3.1
Epoxy coatings for metal decorative finishes—27.4.1
Epoxy coatings protect copper and brass—27.3.14
Epoxy compounds from unsaturated fatty acid esters—32.4.1
Epoxy ester—6.2.6
Epoxy-furane blends—6.1.7
Epoxy resins—6.1.1
Equipment replacement—34.1.8
Ester reactions of fatty materials—23.1.19
Estimating quantity of materials needed for finishing furniture—30.1.19
Ether resins, acid-modified—2.1.12
Etherified condensation products—9.1.8
Ethoxylines—6.1.3
Experiments on paint adhesion under moist conditions—37.9.2
Extensiometer for testing putty and similar materials—27.12.2
Extension of polystyrene chains—14.1.11
Exterior coatings for wood—26.4.8
Exterior coatings, getting most from—26.4.3
Exterior durability of emulsion paints—37.3.7
Exterior house paints—26.4.7
Exterior paints based on acrylic emulsions—28.2.1
Evaluation of dehydrated castor oil in exterior white house paints—26.4.9
Evaluation of emulsion paints—28.1.7
Evaluation of "Hysoy" in exterior paints—26.4.6
Evaluation of organic protective coatings—38.1.6
Evaluation of printing inks and paper stocks—27.11.3
Evaporation of binary and ternary solvent mixtures and their release from lacquer and resin films—22.1.7
Evaporation of thinners and solvents—22.1.6

F

Factors in the application of the color aptitude test—38.3.1
Factors influencing the efficiency of electric infrared drying and baking—31.2.1
Factors influencing the unrubbed glossiness of metal lacquers—27.7.5
Farnow varnish paint—33.1.1
Fat-based surface-active agents—24.5.2
Fatigue reduction in the paint plant—1.3.2
Fats and oils, economic trends—23.1.17
Fatty acids for the alkyd industry—23.11.9, 23.11.11
Fatty acids in the soybean seed, rate of formation—23.5.1
Fatty acids, long chain, polymerizable derivatives of—18.1.2
Fatty acids, news about latest—23.11.12
Fatty alcohols—23.12.1
Fatty oils, processing—23.1.14
Federation corrosion committee meeting review—27.3.5
Film formation, film properties, and film deterioration—37.1.10
Film thickness measurement—38.11.1
Filters—34.5.1
Finishes for all purposes—27.1.7
Finishes for metal products—27.1.13
Finishes for military equipment must resist corrosion—29.2.4
Finishes for plastics—27.16.2
Finishes that stand metal forming—27.4.2
Finishing aircraft in 100 foot booth—30.2.9
Finishing defects, how to cure—37.1.8
Finishing large plastic moldings—30.2.8
Finishing methods that cut waste—30.2.14
Finishing transformers by flow coating and spray—30.1.6
Finishing wood turnings in a tumbling barrel—30.1.20
Fire extinguishers, why they can let you down—36.1.5
Fire hazard of surface coatings—36.1.8
Fire retardant coatings—26.3.6
Fire-retardant compositions—26.3.7
Fire retardant paints—26.3.3, 26.3.4, 26.3.5
Fire safety in organic industrial finishing—36.1.7
First steps in finishing—29.1.3
Flame photometry—38.3.6
Flame photometry and spectrophotometry—38.8.6
Flameproofing composition—24.13.1
Flame-proofing composition, phosphate-type—24.13.2
Flameproofing solution—24.13.3
Flame-retardant plasticizer for protective coatings—20.2.6
Flammable liquids, piping of for safety—35.4.3
Flat wall paints, how pigmentation affects—26.2.3
Flooding and floating observations of titanium dioxide-iron blue enamels—21.1.7
Floor coating dispersions, aqueous resin-wax—28.1.20
Floor finishing—27.1.12
Floors, how to install them for long life—34.1.11
Floors, how to make them last longer—34.1.13
Flow-coating aircraft parts—30.5.2
Fluorescence of drying oils—23.1.23
Fluorescent coating—27.1.15
Fluorescent coating containing boric acid—27.1.14
Fluorine-containing polymers—7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6
Fluorochlorocarbon Dispersion—19.1.7
Fluorochlorocarbon dispersion in ethoxy-ethanol—19.1.8
Foremen and workmen's compensation law—1.3.7
Fork trucks—35.1.1
Formaldehyde, a new spot test for—25.4.2
Formaldehyde: concentrated and pure—25.4.1
Forming and finishing of the Corvette plastic body 30.2.12
Formulation of high-flash lacquers and thinners—27.7.4
Fractionation of castor oil methyl esters by liquid-liquid extraction—23.3.3
Fractionation of lac—10.2.1
Freeze-thaw stability of polyvinyl acetate emulsion paints—37.10.1
From automobiles to bridges is range of asphalt emulsions—19.14.2
Functions and operations of the New York Club's Technical Committee—1.2.22
Fundamental paint calculations—38.1.1
Fundamentals of Paint, Varnish, and Lacquer Technology——23.8.4, 26.4.1, 26.4.2, 27.1.1, 27.1.3, 27.1.4, 27.1.5, 27.1.6, 28.1.6, 28.1.8, 28.1.14, 28.1.16, 28.1.17
Fungicidal paint development—24.3.2
Fungicide—24.3.7
Fungicides in paints—24.3.4
Fungus and fungicides—24.3.1
Furniture finishing, gearing for competition—30.1.4

G

Gas-fired equipment for infra-red baking of paint on metal components—31.2.3
Gelling rates and consistencies of aluminum di-2-ethylhexanoate-liquid hydrocarbon systems—24.4.1
Glass temperatures of copolymers of methyl methacrylate and glycol dimethacrylates—3.1.9
Glycerine alkyds tailored to need, part III—4.1.6
Glycerine, changing times for—25.3.2
Glycerine resin research—4.1.8
Glycerides, treating—23.1.29
Glyceryl monooleate in alkyd base paints—24.1.1
Glycols in alkyd resins, rapid identification—38.7.2
Got a problem?—1.2.10
Grinding organo-polysiloxane gels in the presence of a solvent—16.1.27
Growth of molds on painted surfaces—24.3.3

H

Half-life of the styrene free radical—32.2.2
Half second cellulose acetate butyrate—5.4.1
Handling chemicals, reducing hazards of—36.1.4
Handling of fats and fatty acids—23.11.3
Handling the problem employee—1.3.6
Hard synthetics—11.1.1
Heat of combustion of some organosilicon compounds—16.1.13
Heat resistant adhesives for metal bonding—27.13.3
Heat-resistant allyl resins—17.2.2
High production automatic dip finishing system—30.5.4
Highly intense radiation fields—2.1.2
Hot spray application of vinyl paints—30.2.1
Hot spray solves many finishing problems—30.2.11
How far will your paint go?—37.12.1
How many coats of paint for your product?—30.1.12
Human frailties vs. your safety—36.1.3
Hybrid paraffin-siloxanes containing the 1,6-disilahexane grouping—16.1.19
Hydration of azo dyes in organic solvents—21.14.3
Hydrocarbon and coumarone indene resins—8.2.1
Hydrocarbon resins, raising the softening point of—8.3.2
Hydrogen peroxide as initiator in acrylic polymerization—32.2.22
Hydrogenation of castor oil—23.3.2
Hydroxyethyl nylon—12.1.5

I

Industrial evolution and the paint industry—1.2.27
Industrial finishing in India—30.1.9
Industrial finishing methods review—30.1.10
Industrial maintenance coatings based on phenolic resins—11.1.3
Inedible fats and fatty acids, history and technical trends—23.11.2
Inedible fats and fatty acids, raw materials for and recovery of—23.1.18
Influence of molecular weight and degree of cross-linking on the specific volume and glass temperature of polymers—2.1.11
Influence of paper on the autoxidative drying of printing inks—27.11.4
Infrared studies on solutions of synthetic polyacids and polyampholytes—38.8.3
Inorganic pigments—21.6.2
Insecticidal lacquers—27.7.3
Insulating materials and functional evaluation—27.14.2
Insulation coatings, new ideas on—27.14.3
Interaction of β -particles with organic liquids in the presence of vinyl monomers—32.1.4
Interaction of polydimethylsiloxanes with swelling agents—16.1.23
Interior wall paints based on vinyl acetate resin latex—28.3.1
Intrinsic viscosity by a graphic method for single-point determination—38.4.18
Investigation of unusual orientation in polyethylene by infrared spectroscopy—13.1.3
Ionic chlorination of polystyrene—14.1.9
Ionic polymerization—25.7.6, 32.2.12
Ionic spray boosts production—30.2.5
Isocyanate-base polymers—9.4.2
Isocyanate coatings—tomorrow's wonder products?—9.4.1
Isolation of a new resin acid from gum rosin—palustric acid—15.1.3
Isophthalic—25.2.1, 25.2.2
Isopiestic method for determining molecular weights of polymers—38.5.5

K

Kaolin processing—21.3.2
Kinetic constants for styrene polymerization—14.1.8
Kinetics of polymerization of styrene initiated by the system benzoyl-peroxide-dimethylaniline—32.2.9

L

Lac derivatives as plasticizers—20.3.1
Lacquer technology becomes more complex—37.1.4
Lacquer troubles on wood—27.10.2
Lake colours—21.1.1
Laminated speed boats, hand finishing of—30.1.7
Lanolin in putty—27.12.3
Large motors need special protection—35.3.1
Latest test data on molybdate orange pigments—21.6.3
Latex jolts paint industry—28.1.15
Latex paint formulation, basic concepts—28.1.9, 28.1.10, 28.1.11, 28.1.13
Legal points for paint company executives—1.4.2
Light-fastness of lead chrome pigments—21.6.1
Linear polyesters derived from vanillic acid—4.1.16
Linear visco-elastic behavior of paint films as a function of time and temperature—38.4.8
Linseed oil, drying—24.2.2
Linseed oil putty study—27.12.1
"Little Florida" weatherometer may help improve car finishes—37.3.2
Localized color filling and application—30.1.11
Long chain compounds—24.10.2

Long-chain vinyl esters and ethers preparation from commercial raw materials—25.7.9
Long spray lances paint insides of steel tubing—30.2.18
Low temperature solubilities of fatty acids in selected organic solvents—23.11.8
Lower cost latex systems—28.1.2

M

Magnesium silicate, talc, review—21.3.7
Maintenance painting economics—1:2.40
Maintenance painting in the process industries—26.5.1
Making monomers and polymers with sodium—32.2.10
Manufacture of aluminum paste—21.13.1
Manufacture of industrial cellulose nitrate—5.2.3
Manufacture of nitrocellulose—5.2.2
Mass spectrometry, modern industrial tool—38.8.7
Mastic exterior coatings—26.1.2
Material handling need for coordination of—35.1.4
Materials handling—several methods for identifying the contents of drums—34.4.3
Measurement and specification of color and small color differences—38.3.5
Measurement of polymerization rates by means of infrared absorption spectra—32.2.24
Mechanical properties of paint films in relation to weathering—27.3.11
Mechanism of the drying of oils—32.3.2
Mechanisms of paint film breakdown—32.1.1, 37.3.1
Melamine-formaldehyde resin, modified—9.2.3
Melamine resins, modified—9.2.2
Melting of cellulose nitrate—5.2.1
Melting points of chain polymers—38.12.1
Metal-bonding adhesives with improved heat resistance—27.13.1
Metal cleaning with ultrasonics—29.1.11
Metal treating material—29.1.15
Metallic azo pigments—21.5.3
Metallic pelargonates, properties and applications—24.4.2
Methods and materials for preventing the skinning of paint—24.14.1
Methanol synthesis, better—22.4.1
Method of amplifying paint mixtures—26.1.5
Methyl methacrylate, inhibition of polymerization—3.1.5
Microviscometer, absolute, ball & Cup—38.4.3
Mildew strains, are they fighting back?—27.18.1
Minerals in the paint industry—21.3.3
Misting problems in printing—27.11.6
Mixed plasticizers in vinyl chloride resins—20.1.2
Mixing mill—34.2.4
Mixing, review—34.2.1
Molecular weight measurements of standard polystyrene samples—14.1.10
Molecular weight of polyvinyl acetate by light scattering and viscosity techniques—38.5.6
Molecular weights determined by light scattering, evaluating the reliability of—38.5.4
Monoglycerides and glycerine determination in mixtures—25.3.5
Multicolor lacquers—27.7.1

N

National Paint Salesmen's Association needs more "bees"—1.5.1
National survey of consumer painting habits—1.2.14
Naval stores outlook—15.1.1
Navy finds organic finishes aid in protecting selenium rectifiers against mercurial fungicides—27.1.9
Neoprene—27.3.1
New developments in protection of iron and steel against corrosion—27.3.10
New drying oils for caulking compounds—23.1.13
New latex paint vehicles—19.1.1
New paint package—30.3.2
New paints for new automobiles—27.6.1
New pigments from 3,3'-dichloro- and 3,3'-dimethoxy-4,4'-diaminostilbene—21.1.6
New resinous polyalcohol for the coatings industry—25.1.1
New trends in colored house paints—26.4.5
New trends in finishing and decoration—1.2.26
Newspaper inks—27.11.5
Nitrocellulose film—5.2.6
Nitrocellulose, plasticized—5.2.7
Nitrogen-containing derivatives of the fatty acids—24.5.1
Nitromethane properties—22.6.1
No royal road to the application of research—1.2.36
Nomograph for alkyd manufacture—4.1.15
Nomograph for alkyd resin formulation—4.1.10
Nomographs for significance tests—38.6.1
Non-Newtonian viscosities in dilute aqueous solutions of Na carboxymethylcellulose—5.6.1

O

Observations on some testing methods—37.1.2
Odd electrons in polymer molecules—2.1.10
Odor control in paints—24.15.1
Odorless thinner—22.1.8
Odorless thinners 1954—22.2.1
Oleoresinous varnishes from epoxy resins and drying oils—2.2.4
On translations—1.2.30
Operating manual for production employees in the paint and varnish industry—36.1.2
Opportunity in the paint industry—1.2.5
Organic disulfide as initiators of polymerization—32.2.18
Organic finishing occupational diseases cost millions—36.1.6
Organic finishes for concrete floors—26.6.1
Organic pigments—21.1.5
Organization of paint research in the Netherlands—37.1.3
Organopolysiloxane diesters, synthesis and physical properties—16.1.20
Ovens for force drying wood finishes—31.1.4
Oxidation, review—32.3.4

P

Packaging of polyvinyl acetate paints—34.4.2
Paint and varnish industry in Europe—1.2.34
Paint colors, why they vary—38.3.8
Paint corporation, legal aspects—1.4.7
Paint deterioration, method of investigation—37.3.3
Paint failures, who is blamed for?—37.1.9
Paint finishes—27.1.11
Paint for planters—27.3.9
Paint industry literature classification—1.2.4
Paint manufacturers and the Federal Trade Commission—1.4.1
Paint mildew, is it fighting back—27.18.3
Paint, oil base—26.1.3
Paint power by mail—1.5.4
Paint rollers, as extra sales force—30.4.1
Paint rollers come of age—30.4.2
Paint rollers—types and uses—30.4.4., 30.4.5
Paint, rubber emulsion, nonfoaming—28.1.18
Paint, silver—27.1.17
Paint stripping problems and cures—29.3.1
Paint technology needs more science—1.2.25
Paint testing machine—38.4.19
Paint, texture—26.7.1
Paint thinners from petroleum—22.1.9, 22.2.3, 22.1.10, 22.3.1, 22.1.11, 22.1.12, 22.2.4, 22.1.13
Paint viscosity and ultimate pigment volume concentration—38.4.12
Painted surfaces, artificial surface dirts for detergency studies with—37.1.7
Painters save time and money by using portable ventilators—31.1.3
Painting aircraft assemblies—30.1.17
Painting at the Port of New York authority—30.1.3
Painting of plaster surfaces—26.2.1
Painting overhead cranes by airless spraying—30.2.17
Painting plaster surfaces—26.1.1
Paints in 1954, review—1.2.39
Paints, review—1.2.18
Paints, water-base—28.1.21
Pakistan and te paint indhustry—1.2.9
Paper chromatography of unsaturated fatty acid esters as their mercuric acetate addition compounds—23.11.7
Paper work involved in the manufacture of paint—1.2.35
Paraffin wax—24.10.6
Particle size distribution in brominated Hevea latices—19.13.1
Particle surface area, precise measurements with the microscope—38.1.3
Parts spray finished on 3 conveyors in compact finishing setup—30.2.13
Pentachlorophenol, detection of in treated wood—24.3.5
Petroleum thinners for the paint industry—22.2.2
pH in the paint and color industry—38.1.8
Phase separation in solutions of vinyl polymers—18.1.5
Phenolic esters, titration of in ethylenediamine—38.7.3
Phenolic, modified—11.3.1
Phenolic resins, study of their chemistry and use—11.1.4
Phosphate finishes—29.2.1
Phthalocyanine pigments, preparation of—21.7.1
Physical characteristics of epoxy resin films—6.1.10
Physics in paint manufacture—34.1.14
Pigment dispersion in acrylic paint systems—34.3.10
Pigment dispersion, theory and practice—34.3.2
Pigmentation of polyvinyl acetate emulsion paints—19.4.8
Pigmented film-forming materials—27.1.19
Pigments, paste—21.1.8
Pioneering in paint-making in India—34.1.1, 34.1.2, 34.1.3, 34.1.4
Pioneers in paint-making—34.1.5, 34.1.6
Plastic emulsion paints—28.1.5
Plasticized sulfur compositions for traffic marking—27.15.1
Plasticizer behavior in polyvinyl acetate emulsions—19.4.5
Plasticizer production, 1954—20.1.6
Plasticizers—20.1.4
Plasticizers for poly (vinyl chloride) resins—20.2.5
Plasticizers for the vinyl market—20.1.1
Plastisols suited for many coating jobs—27.5.4
Polarographic studies of fat oxidation—23.5.4
Polyamide alkyd gels, properties—2.2.3
Polyamide-epoxy resin solution—12.2.3
Polyamide epoxy resins—12.2.1
Polyamide from 2,2'-bis-[5(4H)-oxazolones]—12.1.4
Polyamides based on E-Caprolactam—12.1.3
Polyampholytes—2.1.3
Polyester-isocyanate synthetics—17.3.1
Polyesters—4.1.5
Polyethylene, pile irradiation of—13.2.1
Polymer distribution in drying-oil modified alkyd resins—4.1.4
Polymers, acrylonitrile—8.1.10
Polymers, fungi & bacteria resistant—2.1.13
Polymers of butadiene with monomers containing nitrile, carboxyl, and nitro groups—8.1.5
Polymers, silica-containing—2.1.14
Polymers, ultraviolet determination of combined methyl isopropenyl ketone in—38.7.7
Polymers, unsaturated hydrocarbon—8.1.11
Polymeric compositions—9.1.6
Polymerization, copolymerization and isomerization—32.2.5
Polymerization kinetics of a cyclic dimethylsiloxane—32.2.11
Polymerization of diallyl phthalate—17.2.3
Polymerization of methyl methacrylate by pulses of high-energy electrons—3.1.8
Polymerization of o-p-toluylbenzoic acid—2.1.9
Polymerization of vinyl acetate at low temperatures—18.2.4
Polymerization, review—32.2.16
Polymethyl methacrylate—3.1.11
Polyphenyl—7.3.1
Polysiloxane resin compositions—16.1.26
Polystyrene, review—14.1.3
Polysulfide liquid polymer studies—8.1.7
Polysulfide liquid polymers—8.1.6
Polytetrafluoroethylene coating—27.1.22
Polyurethanes on the way—9.4.3
Polyvinyl acetate and copolymer terminology—19.4.4
Polyvinyl acetate emulsion base paints—28.1.3
Polyvinyl acetate emulsion paint systems—28.1.1
Polyvinyl acetate emulsion paints, review—19.4.1
Polyvinyl acetate synthesized in Great Britain—18.2.2
Polyvinyl butyral, modified compositions—18.7.3
Polyvinyl chlor-acetates, application, physical characteristics and chemical resistance—18.4.1
Polyvinyl chloride, plasticization with alkyl esters of pinic acid—20.2.1
Polyvinyl formal, thermal properties of cured sheet—18.8.1
Polyvinylpyridine, emulsifiers for polymerization in acidic media—18.1.3
Position of synthetic resins in India—2.1.1
Practical techniques for recovering free paint films from a variety of substrates—38.1.2
Precision rotation viscometer—38.4.15
Precision viscometry of polymer solutions—38.4.16
Pre-paint treatment of ferrous surfaces—29.2.3
Preparation and characterization of block copolymers—32.2.21
Preparation and properties of poly-p-xylylene—8.1.3
Preparation of Kamala fat and a quick-drying paint oil from it—23.1.9
Preparation, properties and structure of polyhydrocarbons derived from p-xylene and related compounds—8.1.2
Preparing surfaces for painting—29.1.2
Pretreatment improves finish quality—29.1.5
Primers for ferrous metals—27.2.2
Printing inks and indigenous raw materials—27.11.1
Problems of interior and exterior resin-emulsion coatings—19.1.2
Process for recovering fats and oils—23.1.31
Processing of epoxy resins—6.1.5
Production and refining of drying oils—23.1.26
Production of polyvinyl esters by ester interchange—18.2.1
Production of sec-butylated melamine-formaldehyde resins—9.2.1
Products of the heat-thickening of linseed oil—23.2.1
Progress—1954—1.2.15, 1.2.16, 1.2.17
Progress in polythene—13.1.1
Properties and applications of epoxide resin esters—6.2.3, 6.2.4
Properties of well-defined suspension of solids in liquids—38.1.7
Protection of steel—27.3.15
Protective coating systems, preliminary evaluation of—37.1.12
Protective coatings for electrical connections—27.14.1
Protective coatings industry, a practical science—1.2.11
Pyridine mercurials—24.3.6

Q

Quality paint brushes are still regarded as painter's best tool—30.6.1

R

Rapid testing of technical polyvinyl butyral—18.7.2
Rate of thermal diffusion of polymer molecules in solution—14.1.7
Raw materials for new latex paint vehicles—25.7.1
Raw materials survey—1.2.23, 1.2.24
Reaction of cellulose with acetic acid—32.1.5
Reaction of formaldehyde and secondary amines with some olefins—9.1.5
Reactive hydrocarbon-drying oil adducts—23.1.22
Recent advances in drying oils—23.1.27
Recent developments in antifouling paints—27.19.2
Recent developments in condensation polymers for paint vehicles—2.1.6
Recent developments in iron oxide pigments—21.4.1
Recent developments in the mechanical testing of materials—38.4.9
Recent developments in plastics—2.1.8
Recent developments in polystyrene and modified polystyrene plastics—14.1.5
Recent developments in spray-painting—30.2.2
Recent developments in surface coating—1.2.41
Recent progress in lacquer finishes—27.7.2
Red lead against corrosion—21.12.1

Red lead paints for galvanized surfaces—27.3.2
Reductive amination of ethylene/carbon monoxide polyketones—24.10.4
Refined paraffin waxes, effect of streamlining on stresses in the Perkins tensile test—24.10.5
Reflections on rubber research—32.2.3
Relationship between composition and mechanical properties of films—19.1.5
Relative reactivities of polymer radicals in vinyl polymerizations—32.2.20
Removing coating films—29.3.3
Removing paint and varnish—29.3.4
Removing paints—29.3.2
Research as the key to future markets for drying oils—23.1.20
Research related to protective coatings at the utilization research branches—23.1.2, 23.1.4
Resin and paint production—34.1.7
Resin, high softening point—8.3.1
Resin melter, novel—35.1.5
Resinous compositions—15.1.4
Resinous Phenol-aldehyde derivatives—11.2.2
Resinous polyol—25.3.3
Resinous polyol for coatings industry—25.3.1
Resins, aminoplast—9.1.7
Resins, copolymer—18.1.7
Resins, polyurea—9.3.1
Review of condensation polymerization—32.2.13
Review of surface coatings developments—1.2.6
Review of the paint industry, 1954—1.2.13
Review on plastics from proteins and lignin—9.1.2, 9.1.3
Rheology of filled siloxane polymers—16.1.18
Role of calking in satisfactory paint jobs—27.12.4
Room-temperature converting epoxy resins—6.2.2
Rosin derivatives in surface coatings—15.1.2
Rotational molding of plastisols—27.5.5

S

Salt spray test, 5%, and its acetic acid modification—37.1.6
Saponification value determination of difficulty saponifiable drying oil products—38.1.4
Saran and vinyl coatings, recent Navy experience with—27.3.7
Scattering of light from thin polymer films—38.3.9
Science for the coatings technologist—21.11.2
Screen printing cloth by hand and automatically—30.7.1
Secrecy—1.3.5
Selection of color matchers—38.3.7
Selling surface coatings through sample distribution—1.5.2
Semimicro dilution viscometer—38.4.17
Separation methods for production of fatty acids—23.11.4
Setting liquid protein containing coatings—27.1.24
Shellac plastics—10.2.2
Side chain crystallization of n-alkyl polymethacrylates and polyacrylates—3.1.6
Significance of the tack-free test—37.2.1, 37.2.2
Silicon compounds, vapor pressures of—16.1.11
Silicone fluids—16.1.5
Silicone in protective coatings—16.1.6
Silicone molding resins—16.1.9
Silicone resins for protective coatings—16.1.22
Silicone resins having phenyl and methyl groups attached to silicon—16.1.28
Silicone resins in textiles—16.1.4
Silicones—16.1.1, 16.1.15
Silicones advance—16.1.16
Silicones in Naval shipboard electrical equipment—16.1.8
Silicones in the paint industry—16.1.17
Silicones, properties and uses—16.1.2
Silicones, structure and properties—16.1.3
Simplified method for the analysis of alkyd resins—38.7.9
Size and shape of droplets in demixing polymer solutions in a field of flow—1.2.19
Solubility of gases and vapors in crosslinked polymers—2.1.5
Solubility of gases in molten paraffin and microcrystalline waxes—24.10.1
Solubility parameters—22.1.3, 22.1.4
Solvent independent parameters in the viscometry of polymer solutions—38.4.14
Solvent output heads down—22.1.2
Solvents for nitrocellulose lacquers—22.4.3
Some pyrrols, phenols and pyridines contained in a gilsonite distillate—8.6.2
Sorption of nitrogen dioxide by cellulose acetate—5.3.4
Special heavy-duty hose coupling for speeding blending operations—35.4.1
Special ovens for two-tone car bodies—31.2.2
Specific surface of sieve-size powders, determination of—38.10.2
Spontaneous combustion of various catalysts for epoxy resins—36.1.1
Spray heads need lots of care—30.2.7
Spray painting method, making the most of—30.2.3
Spray problems with hot lacquers—30.2.16
Spraying electrostatically, what and how we gained—30.2.15
Stability of cellulose bronze lacquers—27.7.6
Stability of toluidine red in latex paints—21.5.2
Stabilization of polyesters to light—17.1.1, 24.8.3
Stabilized chlorine containing vinyl resins—18.1.9
Stabilizers for vinyl chloride resins—24.8.4
Statistical analysis, application to analytical data—38.6.2
Statistical evaluation of odor levels in flat wall paints—26.2.4
Statistical quality control methods in chemical industries—34.6.1
Statistics in research—38.6.3
Status of ink in the printing industry—27.11.7
Stress-strain properties of films of pigmented or emulsified alkyds—4.1.3., 19.7.1
Structural analysis of Novolacs—11.2.1
Structural laminates from epoxy resins—6.1.4
Structural properties of synthetic resin emulsion paints—28.1.12
Structure of bodied oils—23.1.7
Structure of oils and resins—38.8.4
Structure of paint films—38.1.10
Structure of polysiloxanes—16.1.24
Structures of anatase and rutile—21.2.5
Studies on dehydrated castor oil—23.3.4
Studies on lignin and related products—10.1.1
Studies on polyvinyl chloride—18.3.3
Studies on the flocculation of phthalocyanine blue—21.8.1, 21.8.2
Studies on the formulation of fire retardant paints—26.3.1, 26.3.2
Study of alcoholysis and hydrolysis of cellulose triacetate in chloroform—5.3.2
Study of alkyd resins—4.1.13
Study of pigment dispersion, behavior of toluidine red—34.3.8
Study of pigment dispersions—34.3.1
Study of polymethacrylic acid by the light scattering and osmometric methods—3.1.4
Study of primers for ferrous metals in an atmospheric exposure—27.2.1
Study of the glass transition in polyvinyl chloride—18.3.4
Study of the order-disorder transition in polytetrafluoroethylene—13.3.3
Styrenated drying oils and resins—23.1.25
Styrenation of alkyds with controlled maleic functionalities—4.4.1
Styrene and phthalate and fumarate esters in polyester resins, ultraviolet spectrophotometric determination—38.8.5
Styrene, polymerized, ultraviolet spectrophotometric determination of in styrenated fatty acids and alkyd resins—38.7.4
Styrene-butadiene copolymers, big markets for paints from—8.5.1, 8.5.2
Surface-active phenol ethers, detection with sulfuric acid and formaldehyde—24.5.5
Surface coating applications of epoxide resins—6.1.9
Surface coatings derived from "Epon" resins—6.1.6
Surface coatings for cans and tubes—27.4.3
Surface technology, scope of—1.2.8
Surface treatment and finishing of light metals—29.1.7, 29.1.8, 29.1.12, 29.1.13
Sulfonation products from polymers of styrene and vinyltoluene—14.1.1
Survey of chromate treatments—29.1.9, 29.1.10
Sward rocker calibration—38.2.2
Swelling and absorption by cellulose acetate in binary solvent-hexane mixtures—5.3.5
Symposium on castor oil—23.3.1
Synthesis and polymerization of ethylenesulfonic acid—25.7.5
Synthesis and polymerization of vinyl sulfonates—18.1.4
Synthesis of an all-cis diene polymer—8.1.8
Synthetic film—18.9.1
Systematic study of low odor alkyd paints—26.2.2 37.1.1

T

Tall oil—23.8.5
Tall oil comes of age—23.8.6, 23.8.7, 23.8.32
Tall oil esters—23.8.9
Tall oil fatty acids trends—23.11.1
Tall oil—its functions in the paint industry—23.8.2, 23.8.3
Tall oil, six years of progress—23.8.1
Technical service requirements—1.5.3
Technology of paper coating—27.17.1, 27.17.2, 27.17.3, 27.17.4
Tendencies of development in the varnish industry—1.2.12
Ternary system ethyl alcohol-n-heptane-water at 30° C—22.1.1
Terpene-derived plasticizers—20.2.2
Terpenes, physical and thermodynamic properties—22.7.1
Tests, what the Navy learned about them—37.1.13
The "cold-mix" varnish technique—2.2.5
The excise levy and after—1.4.5
The law relating to solvents—22.1.5
The "permanent" organic finish—27.1.8
Theory of hydraulic flow control—35.4.2
Thermal conductivity of liquid silicon compounds—16.1.12
Thermal degradation of 66 nylon—12.1.1
Thermal polymerization of drying oils—32.2.6
Thermochemical studies on fluorocarbons—13.3.2
Thermodynamics of crystallization of natural rubber—8.1.9
Thermoplastic resins in surface coatings—18.7.1
Thermoplastic water-soluble synthetic gum—5.7.1
Thixotropy and paints—38.4.4, 38.4.5, 38.4.6
Thixoviscometer for production control—38.4.7
Tins for the paint industry—34.4.1
Tinting strength values of carbon black—21.9.1
Titanate coating solution—5.1.2
Titanium dioxide pigment, determination of surface roughness—21.2.2
Titanium pigments—21.2.4
Toluidine red bloom in baked synthetic finishes—21.5.1
Trade marks and spurious goods—1.4.6
Traffic line paint, beaded—37.1.5
Traffic paint abrasion, measurement with beta rays—37.7.1
Traffic paint, laboratory method of test for no-dirt-retention time—27.15.3
Training industrial salesmen—1.5.8
Treated rutile-type titanium dioxide pigments and their properties—21.2.3
Tung oils, characteristics of domestic—23.4.1
Two-container coating system, newest developments in—12.2.2
Two-stage sorption and desorption of organic vapors in cellulose acetate—5.3.3

U

Ultrasonic degradation of cellulose nitrate—5.2.5
Ultrasonic studies of high polymers—18.3.5
Uniform sales act affect on paint companies—1.4.3
Unit heaters prove useful in paint drying operation—31.1.2
Unsaturated fatty acids—23.11.6
Unsolved problems in the modification of drying oils—23.10.1
Unsolved problems in the utilization of drying oils in protective coatings—23.1.21
Unusual orientation phenomena in polyethylene—13.1.2
Upgrading the plant's electrical performance—34.1.12
Use of agricultural products in surface coatings—1.2.20
Use of deuterium to investigate extent of branching in polystyrene—14.1.6
Use of diatomaceous calcite as an extender pigment for paints—21.3.5
Use of 2,2,6,6-tetramethylolcyclohexanol in alkyd resins and related coating vehicles—25.3.4
Using creative imagination in coatings—1.2.37, 1.2.38
Utilization of hydrocarbon solvents and thinners in the coatings industry—22.1.15

V

Various approaches to automatic finishing—30.1.14, 30.1.15
Vehicle problems—2.2.2
Vinyl acetate copolymers in water paints—19.4.2
Vinyl acetate, polymerization in emulsion—19.4.9
Vinyl chloride plasticized with polycarboxylates—18.1.8
Vinyl chloride polymers—18.3.6, 18.3.8
Vinyl chloride, production of—18.3.7
Vinyl chloride resin, heat and light degradation of—24.8.2
Vinyl chloride resin plastisols, flow properties of—27.5.2
Vinyl chloride to PVC by suspension polymerization—18.3.2
Vinyl coatings' biggest drawback licked—27.3.4
Vinyl copolymers—18.1.6
Vinyl dispersion resin coatings—organosols and plastisols—27.5.1
Vinyl emulsion paints, theoretical and practical aspects—19.4.6
Vinyl resin solutions and dispersions for industrial metal protection—18.4.2
Vinyltoluene in paints and varnishes—25.7.2
Vinyltoluene oil copolymers and their use in flat wall paints—2.2.1
Vinyls—18.1.1
Viscometer, high rate of shear rotational—38.4.11
Viscosity, need to control—38.4.13
Viscosity measurement of thermosetting resins by parallel plate plastometry—38.4.1
Viscosity measurements in branched silicones—16.1.25
Viscosity stability of plastisols—27.5.3

W

Washington traffic paint from laboratory to roadway—27.15.2
Water adsorption in polystyrene, cellulose triacetate, and polyvinyl chloride below saturation vapor pressure—37.8.2
Water induced acceleration of the diffusion of organic vapors in polymers—37.11.1
Water paint containing enzyme-digested protein—28.1.19
Water resistance of air-dried alkyd resins—37.8.1
Water-resistant gypsum composition and emulsions—19.1.9
Water tolerance values of vinyl plasticizers—20.1.3
Weathering of polyvinyl chloride—18.3.1
Wetting and dispersion of pigments—34.3.3, 34.3.4, 34.3.5, 34.3.7
Wetting and dispersion of pigments in printing inks—34.3.6
What about application, Mr. Formulator?—30.1.5
Where and how to use epoxies—6.1.8
Whitening agents, fluorescent—24.1.6
Why paint at all? 30.1.8
Women on the plant staff—1.3.4
Wrinkle finishes—27.20.1
Wrinkle phenomenon, high polymer theory of—32.1.2

Y

Yellowing and gloss retention of pure oil esters and alkyds—4.1.11

Z

Zein in protective floor finishes—24.1.4
Zinc oxide manufacture and its uses—21.2.1
Zinc stearate in protective coatings—24.4.4
Zinc sulfide white pigment, stabilization of—21.2.6
Zirco drier catalyst and the paint formulator—24.2.4

AUTHORS' INDEX

A

Abere, J. F.—7.1.2, 7.1.3, 7.1.6
Acaster, C. A.—27.12.3
Adams, M. L.—38.7.8
Adicoff A.—17.2.2
Aelony, D.—32.1.3
Agens, M. C.—24.16.1
Aggarwal, J. S.—23.3.1, 23.3.2, 24.2.1
Aggarwal, S. L.—13.1.4
Ahlbrecht, A. H.—7.1.1
Ahlers, N. H. E.—38.8.4
Ajmani, G. M.—23.1.10
Alderson, R. O.—18.2.1
Alexander, A. E.—19.1.3
Alexander, A. L.—27.19.2, 32.3.3
Alexander, W. J.—5.2.5
Alford, S.—18.3.4
Alfrey, T.—3.1.6
Algar, D. J.—34.4.1
Allsebrook, W. E.—27.4.3
Allyn, G.—26.4.7,34.3.10
Allyn, G. D.—3.1.1
Andersen, D. E.—19.8.1
Anderson, J. K.—4.1.16
Anderson, R. N.—35.1.5
Anderson, W. S.—8.1.5, 25.7.3
Ansul, G. R.—16.1.19, 16.1.20
Arlman, E. J.—32.2.26
Arnold, M. H. M.—1.3.5, 22.1.5, 24.14.1
Arvin, J. A.—9.1.7
Asaff, A. G.—27.1.18
Asbeck, W. K.—38.4.12
Aserkar, D. V.—34.3.7
Athawale, V. D.—4.1.14
Ault, W. C.—23.11.2
Austin, J. M.—27.5.2
Auten, R. W.—9.3.1

B

Babcock, G. M.—21.10.1
Baer, B.—29.1.4
Bafna, S. L.—23.1.12
Bagley, E.—5.3.3
Bailey, D. L.—16.1.10
Bailey, W. J.—8.1.8
Baird, D. G.—30.1.16
Baker, W. O.—2.1.10
Baldwin, D. E.—15. 1.3
Ball, F. M.—5.4.1, 5.4.2
Ballantine, D. S.—2.1.2
Barber, E. M.—38.4.11
Bardin, P. C.—29.1.6, 30.5.5
Barnett, G.—19.4.5
Barr, Jr., H. W.—23.1.20
Barrett, W. R.—1.2.5
Barrow, G. M.—22.1.14
Barry, A. J.—16.1.21
Barry, E. L.—1.2.23, 1.2.24
Baumann, F. H.—27.15.3
Beacham, H. H.—5.1.2
Beakes, H.—26.4.7
Beakes, H. L.—27.3.6
Beal, R. E.—23.5.2
Beardsley, H. P.—28.1.3
Beaver, R. C.—30.5.2
Beck, E. S.—21.11.2
Becke, F.—24.3.7
Beekman, E. M.—16.1.9
Bell, A. E.—26.4.3
Bell, E. P.—29.1.14
Bell, S. H.—38.1.10
Bentley, F. F.—11.1.2
Bermane, D.—27.3.13
Bernard, L. L.—1.5.6
Berry, K. L.—2.1.14
Berryman, D. W.—1.2.29
Bessey, G. E.—27.12.1, 27.12.2
Beyer, D. L.—10.1.1
Bhale, V. M.—23.1.12
Bianchi, J. P.—16.1.24
Bigos, J.—27.3.13
Billmeyer, Jr., F. W.—3.1.7, 38.10.1
Binder, J. L.—38.8.2
Black, J. M.—27.13.1
Blackmore, P. O.—37.1.10
Blaikie, K. G.—25.7.4
Blomquist, R. F.—27.13.1
Blount, E. A.—30.2.13
Bobalek, E. G.—2.1.6, 21.1.7, 30.1.10, 38.1.2
Bock, L. H.—4.1.16
Boelhouwer, C.—11.2.1
Bohlen, J.—36.1.1
Bolley, D. S.—23.3.3
Bolstad, L.—6.1.8
Bond, A. E.—18.3.6
Bondy, C.—19.4.6, 19.4.7
Borders, A. M.—7.1.6
Bosch, W.—4.1.3, 19.7.1
Bovey, F. A.—7.1.2, 7.1.3, 7.1.4, 7.1.5
Bowen, Jr., L.—27.12.4
Bowles, R. F.—27.11.7
Bowman, J. R.—24.10.5
Boyd, T.—27.1.23
Brace, H.—23.1.26
Braconier, F. F. A.—18.3.7
Bradley, T. F.—6.1.10
Bradshaw, S. E.—23.1.30
Brady, A. P.—28.1.18
Bragdon, C. R.—4.1.6
Braidech, M. M.—36.1.7
Brandner, J. D.—5.2.7, 5.3.6
Brass, P. D.—24.5.3
Brauer, G. M.—3.1.3
Braunstein, M.—26.1.4
Brazell, E.—1.2.21
Brenner, W.—6.1.7
Breslow, D. S.—25.7.5
Brock, M. J.—24.1.5
Brode, W. R.—21.14.3
Broeker, J. F.—26.4.4, 26.4.8
Bromstead, E. J.—27.4.1
Broockmann, K.—18.7.2
Brouillard, R. E.—21.1.4
Brown, A. G.—28.1.18
Brown, D. S.—24.10.3
Brown, D. W.—14.1.6
Brown, J. B.—23.11.8
Browne, F. L.—26.1.2
Bruins, P. F.—20.2.5
Brunt, N. A.—38.4.8
Brushwell, W.—23.8.2, 23.8.3, 26.3.3, 26.3.4, 26.3.5
Bruxelles, G. N.—27.7.5
Bueche, A. M.—16.1.14, 16.1.23
Buege, F. J.—25.7.2
Bullock, H. L.—36.1.3
Bunn, C. W.—12.1.6, 38.12.1
Burnett, G. M.—18.2.4
Burns, D. F.—26.2.3
Burrell, H.—1.2.39, 2.2.2, 22.1.3, 22.1.4, 32.1.2
Butler, J. M.—18.1.8

C

Caldwell, W. A.—5.2.2, 5.2.3
Campbell, A. W.—20.2.3
Campbell, J. B.—27.7.1, 27.16.2
Campbell, J. G.—37.3.7
Campbell, W. E.—38.4.3
Canterino, P. J.—19.4.9
Capell, R. G.—24.10.1, 24.10.6
Carr, E. M.—17.2.1
Carrick, L. L.—37.9.3
Carter, R. J.—23.3.5
Casapulla, S.—16.1.9
Cave, W. T.—25.7.4
Chalmers, J. M.—34.5.1
Chaloner, S. D.—23.1.31
Chambers, G..F.—16.1.11
Chanda, P. C.—1.4.5
Chang, S. S.—23.5.4
Chang, Y.—32.2.7
Charlesby, A.—16.1.25
Chatfield, H. W.—27.1.7
Chermisinoff, P. N.—24.4.4
Cherry, Jr., C. E.—27.3.2
Chester, H. W.—30.1.19
Chinai, S. N.—3.1.11, 38.5.6
Christ, E. H.—27.3.14
Cipriano, A. L.—2.2.1, 25.1.1, 25.3.1, 25.3.3, 25.7.2
Clare, I. C.—21.4.1
Clark, H. A.—16.1.28
Clarke, H. J.—24.14.1
Claver, G. C.—32.2.24
Clay, B.—38.5.4
Clay, H. F.—21.6.1
Cleaver, C. S.—12.1.4
Cleereman, K. J.—38.4.2
Cleverdon, D.—38.4.14
Close, G. C.—29.1.5
Codding, D. W.—7.1.1
Cody, L. W.—27.15.2
Coffman, D. D.—24.10.4
Cogshall, J. H.—1.2.40
Cohen, S. G.—12.1.5
Coleman, R. J.—32.2.25
Conery, G. F.—21.2.6
Conley, J. W.—21.1.5
Connolly, F. P.—26.4.7
Conrad, G. A.—27.20.1
Conrad, H. A.—19.4.3
Contos, N. G.—2.2.3
Conyne, R. F.—20.2.1
Cook, E. V.—30.1.6, 30.2.5
Cook, F. E.—29.1.1
Cooke, R. K.—30.1.7
Cooke, T. F.—21.7.1
Cooper, F. P.—23.1.23
Coover, H. W., Jr.—8.1.10
Corbett, L. W.—8.6.1
Corcoran, N.—34.1.14
Corley, R. S.—8.1.3
Costanza, A. J.—32.2.23, 32.2.25
Cotman, Jr., J. D.—18.3.3
Coupe, R. R.—27.11.4
Cowan, J. C.—23.1.2, 23.1.4, 32.2.5
Cowee, M.—21.1.3
Cowell, E. E.—2.1.13
Cox, A. B.—27.3.12
Cox, D. S.—38.3.6, 38.8.6
Cox, S. R.—35.2.2
Cragg, L. H.—38.5.2
Craig, L. E.—25.7.9
Craig, W.—8.2.1
Cranmer, W. W.—27.1.10, 27.3.7
Crawford, H. R.—22.4.2
Creasy, J.—5.2.2
Creasy, J. J.—5.2.3
Crecelius, S. B.—6.2.5, 32.3.3
Cromer, D. T.—21.2.5
Crouch, W. W.—8.1.4
Crouse, W. A.—37.7.3
Currie, C. C.—16.1.5
Cutter, J. O.—19.1.4
Czuha, Jr., M.—38.7.7

D

Daggett, W. F.—27.7.4, 27.7.6
Daidone, P. C.—20.1.3
D'Alelio, G. F.—9.1.6
Dammers, H. F.—24.5.4
Danziger, B. H.—21.6.3
Darby, J. R.—2.1.13, 27.5.3
Das, P. R.—34.4.5
Daudt, W. H.—16.1.21
DaValle, A. J.—34.1.7
Davidsohn, A.—38.7.9
Davis, J. P.—19.1.2
Davis, L. G.—31.1.3, 37.3.2
Davis, R. H.—23.11.6
Davis, R. W.—25.7.9
Day, A. G.—37.8.2
Day, E. J.—8.6.3
Dazzi, J.—18.3.8
Dean, R. T.—17.1.1, 24.8.3
Dearborn, E. C.—6.1.12
Debye, P. J. W.—14.1.11
Dechaux, C.—27.3.13
DeCoste, J. B.—18.3.1
Deichert, W. G.—38.1.11
DeLong, L. F.—21.5.2
den Otter, H. P.—6.2.1
Deribere, M.—21.11.1, 38.1.8
DeThan, C. B.—3.1.7
de Wilde, M. C.—14.1.9
Dharap, N. D.—27.11.3, 34.3.3
Dick, J.—13.1.1
Dickey, J. B.—8.1.10
Dickey, R. M.—27.1.23
Diefenderfer, H. H.—27.15.3
Dimmick, F. L.—38.3.1
Dipner, C. D.—19.1.8

Dodd, C. G.—38.1.3
Dole, M.—13.2.1, 18.3.3, 18.3.4
Domicone, J. J.—16.1.21
Done, S. S.—30.1.8
Doss, J.—29.2.2
Drubel, R. B.—25.1.1, 25.3.1, 25.3.3, 25.7.2
Dubrow, B.—38.10.2
Dudenbostel, Jr., B. F.—38.8.7
Duerkheim, B.—24.3.7
Duke, O.—35.1.5
Dumitru, T. E.—38.5.2
Dundon, G. S.—27.1.24
Dunn, Jr., E. J.—26.4.7
Duus, H. C.—13.3.2
Dworkin, D.—8.1.6
Dyer, E.—18.1.7
Dyer, G. J. M.—28.1.5

E

Earhart, K. A.—23.11.5
Eastes, J. W.—21.7.1
Eckey, E. W.—18.2.1
Edwards, G. A.—7.3.1
Edwards, W. A.—27.18.2
Ehrlich, G.—38.8.3
Ehrlich, P.—14.1.2
Eirich, F. R.—17.2.2
Eisenberg, H.—2.1.4, 38.4.15
Elam, D. W.—6.1.4
Elledge, L. R.—34.5.1
Elleman, A. J.—27.3.11
Elliott, R. R.—27.6.2
Elwell, W. E.—25.2.2
Endres, G. F.—32.2.12
English, W. D.—16.1.20
Esposito, G. G.—38.7.8
Epstein, G.—27.13.3
Evans, E. M.—23.1.30
Exley, R.—1.2.2

F

Fair, E. W.—1.3.2, 1.3.3, 1.3.4, 1.3.6, 34.1.8, 35.1.2 36.1.9
Fancutt, F.—27.3.13
Farr, H. O.—1.2.25
Feldon, M.—8.1.1
Feng, P. Y.—14.1.4
Ferington, T. E.—32.1.18
Fernald, R. O.—1.2.14
Fisher, W. G.—26.1.3
Fishman, M. M.—38.5.4
Fisk, P. M.—2.1.7
Fitzgerald, E. B.—4.1.11, 23.1.21, 37.3.6
Fletcher, A. C.—19.4.8, 37.10.1
Flieg, O.—24.3.7
Flood, J. E.—34.5.2
Flournoy, R. W.—37.1.12
Floyd, D. E.—12.2.2, 27.1.2
Follett, A. E.—32.2.15
Ford, L. H.—30.3.1
Fordham, J. W. L.—32.2.14
Formo, J.—6.1.8
Formo, M. W.—23.1.19, 38.1.4
Forrester, A. L.—31.2.3
Fortess, F.—16.1.4
Fox, T. G.—2.1.11
Foy, J. J.—1.2.35, 34.4.6
Fram, P.—32.2.4
Frank, H. P.—14.1.10, 38.5.7
Franklin, P. J.—14.1.2
Frei, E. H.—38.4.15
Frick, J. G., Jr.—24.13.1, 24.13.2
Frisch, H. L.—2.1.5
Fujita, H.—5.6.1
Fuller, R. K.—37.1.7
Fuller, W. R.—1.2.20
Funke, W.—27.3.10
Fuoss, P. M.—6.1.12

G

Gall, R. J.—32.4.1
Gallagher, J. W.—28.1.1
Galloway, L. D.—24.3.3
Gamble, E.—34.3.9
Gamrath, H. R.—29.3.3
Gancherg, A.—16.1.27
Gardner, C.—26.4.7
Gardner, W. H.—4.1.5
Garetto, G.—38.7.6
Garn, P. D.—38.4.3
Gates-Reed, G. H.—24.1.3, 34.1.1, 34.1.2, 34.1.3, 34.1.4, 34.1.5, 34.1.6
Gavin, E. J.—28.1.20
Gearhart, W. M.—5.4.1
Gehant, J.—27.3.16, 27.3.19
Gentleu, N. P.—29.2.1, 27.1.11
George, M. H.—18.2.4
Georgieff, K. K.—25.7.4
Gerlich, H.—27.16.3
Gerson, M. M.—27.6.1
Giannotta, C. R.—38.5.1
Gibson, H. B.—27.14.1
Giersch, R. N.—30.2.17
Gilkey, J. W.—16.1.21
Ginsler, V. W.—4.1.7
Gitter, A. J.—21.3.7
Gladstone, M. T.—18.8.1
Glaser, D. W.—27.1.2
Glaser, M. A.—16.1.6, 27.4.1
Glenn, R. A.—38.7.3
Gminder, T. M.—1.5.1
Goldberg, A. I.—19.4.4
Goldblatt, L. A.—38.8.1
Goldblum, K. B.—16.1.13
Golden, H. R.—8.1.8
Goldfinger, G.—7.3.1, 32.2.2
Golding, B.—4.3.1
Goodman, I.—12.1.1
Goodwin, W. J.—38.3.5
Gopal Rao, P.—21.3.3
Gornick, F.—32.2.19
Gourlay, J. S.—23.3.5
Graham, P. R.—27.5.3
Gray, R. B.—27.1.17
Greaves, J. H.—23.1.27
Green, I.—19.1.7
Green, R.—32.2.27
Greenberg, S. A.—3.1.6
Greenburg, L.—27.3.20
Greenblatt, J. H.—37.1.13
Greene, J. F.—26.1.5
Greenlee, S. O.—6.1.13, 6.3.1
Greenspan, F. P.—32.4.1
Greenwood, B.—29.1.2
Gregg, G. W.—24.2.4
Greminger, G. K.—5.7.1
Griffin, D.—34.1.7
Grinrod, J.—31.2.2
Grossi, F. X.—26.7.1
Grubb, W. T.—16.1.14, 32.2.11
Grupp, G. W.—21.12.2, 27.1.9, 27.19.1, 36.1.6, 37.7.2
Guenther, F. O.—18.8.1
Guillissen, C. J.—16.1.27
Gupta, A. C.—4.1.14, 23.3.1
Gupta, S. S.—23.3.2

H

Haas, H. C.—8.1.3, 12.1.5
Hague, A.—19.5.1
Haines, Jr., H. W.—34.1.7
Haines, R. S.—26.4.6
Hamann, K.—1.2.12
Hammel, D. R.—8.1.1
Hampton, H. A.—37.1.2
Hancock, C. K.—27.15.1
Hancock, H. M.—38.3.2
Hansen, J. E.—18.1.2
Hardiman, J. P.—24.1.1
Harlan, H. R.—38.4.19
Harris, T. G.—11.3.1
Harrison, D. V.—24.10.3
Hart, V. E.—38.4.17, 38.4.18
Hartwell, G. E.—30.6.1
Harwood, H. J.—24.5.1
Hatcher, D. B.—16.1.26
Haward, R. N.—17.2.3
Hawkins, J. E.—22.7.1
Hawtin, S. G.—27.1.19
Hecht, D.—1.5.3
Hedlund, R. C.—16.1.1, 16.1.17, 16.1.22
Heffelfinger, C.—32.2.2
Heiberger, P.—28.1.9, 28.1.10, 28.1.11, 28.1.13
Hein, D. W.—21.1.6
Henke, R. W.—35.2.1
Hennion, G. F.—9.1.5
Henrici, G.—3.1.10
Henson, W. A.—25.1.1, 25.3.1, 25.3.3
Herban, M. S.—12.2.2
Herbst, Jr., R. L.—32.2.20
Herdlein, W.—31.1.4
Hermans, J. J.—38.4.16
Herrington, K.—21.2.5
Herrlinger, R.—23.8.5
Hiles, C. R.—4.3.1
Hiller, Jr., L. A.—32.1.5
Hind, J. D.—4.1.8
Hinkley, E. C.—30.1.20
Hirayama, O.—23.11.7
Hirt, R. C.—38.7.4, 38.8.5
Hoag, S. B.—35.3.1
Hoback, W. H.—34.3.2
Hochberg, J.—27.1.22
Hoehn, H. H.—24.10.4
Hoffman, C. B.—26.4.7
Hoffman, J. D.—14.1.7
Hofrichter, C. H., Jr.—18.9.1
Hogan, A. G.—38.5.4
Holmes, D. R.—12.1.6
Holmes, R. L.—23.4.1
Holmstrom, E. H.—20.2.6
Holzinger, R. J.—28.1.20
Homeyer, H. N.—16.1.9
Homma, T.—5.6.1
Hookway, R. H.—27.21.1
Hopper, F. C.—6.1.4
Hopper, T. R.—6.1.1
Horton, C. W.—38.1.12
Hossenlopp, I. A.—22.6.1
Howard, H. D.—23.1.26
Howton, D. R.—23.11.6
Hrishikesan, K. G.—21.13.1
Huckle, W. G.—21.6.2
Hudson, J. C.—27.3.13
Hulse, G. E.—25.7.5
Hunter, S. N.—21.1.8
Hurd, C. D.—24.3.6
Husted, D. R.—7.1.1
Hyler, J. E.—30.1.11, 30.1.14, 30.1.15

I

Igdaloff, H. B.—4.1.7
Ingle, G. W.—21.2.6, 38.3.3
Inouye, Y.—23.11.7
Inskip, H. K.—8.1.5

J

Jacobs, M. B.—27.3.20
Jaffe, H. L.—28.1.1
James, D. M.—37.9.2
Jarboe, C. H.—18.7.3
Jatkar, S. K. K.—23.3.1
Jeanne, E.—34.2.3
Jenike, A. W.—35.1.6
Jenkins, A. C.—16.1.11, 16.1.12
Jobling, A.—38.4.9
Johnson, G. R.—35.1.1
Johnson, E.—29.1.3
Johnson, F. D.—9.4.1, 27.4.2, 27.18.1, 27.18.3, 30.2.3, 30.2.6, 30.2.8, 30.2.14, 30.5.3, 36.1.5, 37.1.9, 38.4.13, 38.11.1
Johnston, R. A.—4.1.11
Jolly, V. G.—38.3.7
Jones, J. R.—21.1.2
Jones, S.—27.1.14, 27.1.15
Jorczak, J. S.—8.1.6
Jordan, C. B.—38.7.2
Jordan, Jr., E. F.—18.1.2
Jordan, L. A.—1.2.36
Joshi, R. M.—18.2.3
Judd, J. S.—29.3.2

K

Kadesch, R. G.—25.2.3
Kagarise, R. E.—32.3.3
Kalbag, S. S.—23.5.4
Kale, V. V.—23.1.11
Kamath, N. R.—5.4.3, 10.2.1, 10.2.2, 15.1.2, 20.3.1, 21.1.1, 23.1.11
Kane, J. G.—23.3.1
Kane, M. W.—8.1.3
Kapur, S. L.—2.1.8, 14.1.3, 18.2.3
Karam, H. J.—38.4.2
Karlin, E. R.—12.1.5
Katchalsky, A.—2.1.3, 2.1.4
Kather, W. S.—28.1.21
Katz, I.—9.4.2
Kaufman, H. S.—38.5.1
Kaufman, M. H.—8.1.2
Keane, J. J.—38.3.9
Keeling, C. D.—13.2.1
Keller, A.—13.1.2, 13.1.3
Kelly, Jr., M. E.—26.4.7
Kennedy, J. W.—14.1.4
Kern, R. J.—18.1.5
Khan, R. B.—1.2.9
Kice, J. L.—3.1.5
Kienle, R. H.—1.2.11
Kilthau, M. K.—9.2.3
King, C.—32.2.25
King, Jr., F.—21.3.1
King, F. T.—38.7.4
King, M.—21.5.2
Kirshenbaum, A. D.—27.3.18
Kleinschmidt, R. F.—25.7.9
Knaf, H. G.—30.2.16
Knapp, O. E.—21.5.3, 21.5.4
Kniel, I.—38.7.7
Knuth, C. J.—20.2.5
Kobe, K. A.—22.4.2
Koenecke, D. F.—8.3.2
Kohlwey, J. F.—12.1.3
Kolb, D. K.—23.11.8
Kolthoff, I. M.—17.2.1
Koolstra, M. F.—27.10.1
Kooy, J.—38.4.16
Kortland, C.—24.5.4
Kostas, G. J.—32.2.15
Kovacic, P.—19.8.1
Kredentser, H.—34.6.2, 38.3.8
Kreig, A. A.—23.1.17
Kroncke, Jr., C. O.—38.5.1
Kronomeier, M. C.—6.1.11
Kronstein, M.—1.2.8, 21.5.2
Kruty, M.—25.3.5
Kudva, K. G.—2.1.1
Kuhn, W.—1.2.19
Kulkarni, L. G.—10.2.1
Kummerow, F. A.—23.5.4

L

Labbe, B. G.—8.1.5
LaBerge, R. W.—27.1.21
Lakstigala, M.—5.3.2
Lal, J.—32.2.27
Lally, R. E.—18.1.9
Lalor, E.—21.6.2
Lamminan, K. A.—27.12.1, 27.12.2
Lancaster, E. B.—23.5.2
Lanson, H. J.—26.4.7
Lark, P. D.—38.6.2
Larsen, H. E.—29.1.16
Larson, V. L.—27.5.1
Lasko, W. R.—21.2.2
Laundrie, R. W.—8.1.1
Lauren, S.—26.6.1
Lawrence, R. V.—15.1.3
Lawyer, K.—1.5.8
Lazrus, A.—38.5.4
LeBras, L. R.—21.1.7, 38.1.2
Lee, C. R.—5.4.2
Leichner, W. G.—15.1.4
Levi, D. W.—38.5.6
Levy, G. B.—38.5.7
Lewis, A. J.—26.4.6
Li, C. H.—38.6.1
Liberty, G.—27.11.2
Lindenfelser, R.—9.2.3
Lindsay, R. W.—1.5.5
Lippman, E.—34.4.2
Livingston, D. I.—8.1.3
Loeblich, V. M.—15.1.3, 20.2.2
Logan, H.—34.4.2
Londergan, M. C.—28.1.1
Long, F. A.—5.3.3, 37.11.1, 37.11.2

Long, J. S.—1.2.3, 1.2.37, 1.2.38
Lorah, J. R.—22.1.1
Loshaek, S.—2.1.11, 3.1.9
Lovell, J. K.—23.3.5
Ludwig, T. E.—21.5.3, 21.5.4
Luke, V. N.—6.1.2
Lundberg, W. O.—32.2.8, 32.3.1

M

Maasberg, A. T.—5.7.1
Macekonis, F. J.—4.1.3, 19.7.1
Mackin, J. L.—37.1.7
MacMillan, D.—23.5.3
Maeda, Y.—18.3.5
Magne, F. C.—20.2.2
Maher, T. K.—24.1.4
Mahlman, B. H.—27.7.5
Mahon, L. P.—27.14.2, 27.14.3
Majury, T. G.—3.1.8
Malm, C. J.—5.3.1
Manasia, J. P.—17.1.1, 24.8.3
Mandelkern, L.—8.1.9
Manko, W.—11.1.1
Mann, L. C.—1.2.7, 23.8.1
Manning, D. J.—38.1.6
Mansell, R.—30.1.4
Marek, L. F.—32.3.4
Mark, H. F.—8.1.2, 14.1.10
Marotta, R.—26.3.7
Marshall, D. I.—38.4.1
Martin, P. H.—4.1.3, 19.7.1
Martin, R. E.—32.2.20
Marvel, C. S.—8.1.5, 25.7.3, 32.2.25
Marx, P.—13.3.3
Mastrangelo, S. V. R.—38.5.4
Maters, C.—12.1.3
Matlack, J. D.—3.1.11
Maus, Jr., E.—34.3.9
May, W. D.—27.3.11
Maynard, J. T.—24.10.4
Mayne, J. E. O.—37.10.1
Maxcy, W. J.—24.1.1
McConaghie, H. A.—28.1.1
McCormick, Jr., G. W.—31.1.2
McCormack, R. H.—23.3.3
McCullough, J. P.—22.6.1
McFee, W. E.—30.1.18
McGregor, R. R.—16.1.3
McKay, J. F., Jr.—8.3.1, 8.3.2
McKinney, R. S.—23.4.1
McKnight, W. H.—18.1.1
McMaster, W. D.—37.1.6
McNabb, J. W.—18.1.6
McNicoll, D.—23.1.31
Meehan, E. J.—17.2.1
Mehta, I. M.—14.1.5
Mehta, T. N.—32.2.1
Meltzer, T. H.—32.2.9
Melville, H. W.—18.2.4
Melvin, E. H.—23.5.3
Merrill, Jr., T. B.—27.5.4
Mesrobian, R. B.—8.1.2
Metcalf, E. L.—22.1.15
Metcalfe, L. S.—30.2.11
Meyer, H. L.—15.1.1
Michael, T. H. G.—25.3.4
Middleton, J. C.—8.1.7
Miller, E. S.—25.7.9
Miller, I. R.—2.1.3
Miller, W.—30.1.5
Miller, W. T.—27.3.18
Mills, J. F.—29.1.1
Mills, M. R.—23.1.28
Miner, Jr. C. S.—25.3.5
Minor, J. C.—23.4.1
Mitchell, W. S.—12.2.2
Mod, R. R.—20.2.2
Moffett, E. W.—21.1.3
Moilliet, J. L.—24.5.6
Montgomery, J. C.—30.1.13, 30.2.9
Montross, C. F.—25.7.9
Moody, L. S.—16.1.13
Moore, W. R.—5.2.4, 5.3.5
Morrill, H. L.—24.3.5
Morris, M.—29.1.11
Morrison, G. O.—19.4.1, 26.4.7
Morrissey, C. J.—24.3.6
Morton, M.—38.5.3
Mosher, C. W.—20.1.5
Mounce, E. W.—1.3.7, 1.3.8, 1.4.2, 1.4.3, 1.4.4, 1.4.7
Mountsier, Jr., S. R.—21.3.7, 26.4.7
Moyer, P. H.—18.1.3
Muckerheide, V. J.—23.11.4
Muenger, J. R.—38.4.11
Muhlbauer—21.8.3
Mukherjea, R. N.—1.2.26, 11.1.4, 30.2.2
Mulik, N. H.—32.2.1
Muller, G.—18.7.2
Mundy, C. W. A.—23.1.22
Myers, R. R.—24.2.2, 24.2.3
Myles, W. J.—5.3.4

N

Nag, K. K.—30.1.9
Nagaraenkar, V. N.—10.2.1, 10.2.2, 20.3.1, 34.3.4
Nandi, U. S.—32.2.22
Narayan, K. A.—23.5.4
Narayanan, N. N.—23.3.1
Narracott, E. S.—6.2.6
Narzekol, F. J.—30.2.18
Nevenzel, J. C.—23.11.6
Newman, S.—5.2.1
Niehaus, C.—4.1.9
Nieradka, M.—38.10.2
Nikles, O. L.—6.1.6
Noda, M.—23.11.7
Notley, N. T.—14.1.11
Nylen, P.—27.3.13

O

O'Brien, L. J.—32.2.19
O'Connor, R. T.—38.8.1
Offenbach, J.—14.1.8
Ogleaby, A. C.—12.1.5
Olive, S.—3.1.10
O'Neill, L. A.—38.8.4
Opheim, M. H.—18.1.3
Orr, R. J.—32.2.17
Osdal, L. K.—27.1.20
Osthoff, R. C.—16.1.14, 32.2.11
Overberger, C. G.—25.7.6, 32.2.12
Owen, L. A.—24.3.2

P

Pabst, A. C.—28.1.20
Pack, F. C.—23.4.1
Packman, I. B.—30.1.3
Palen, V. W.—38.9.1
Palit, S. R.—32.2.22
Palm, W. E.—18.1.2
Pantaleoni, R.—24.15.1
Park, W. R. R.—4.1.12, 37.8.1
Parker, C. H.—9.1.1
Parks, L. E.—27.16.1
Parrette, R. L.—38.5.5
Parsons, J. S.—21.14.1
Passer, M.—8.1.5
Pattison, E. S.—23.11.1, 25.3.2
Patton, T. C.—26.4.9
Paulson, R.—34.2.2
Peake, J. T.—38.7.3
Pearl, I. A.—10.1.1
Peerman, D. E.—12.1.2
Pennington, R. E.—22.6.1
Pepe, J. J.—38.7.7
Permoda, A. J.—37.9.3
Pessel, L.—27.1.16
Petit, J.—23.1.1, 23.1.3, 23.1.7
Pfeifer, C. W.—16.1.7
Pickard, R. W.—36.1.8
Pickett, O. A.—27.7.2
Pidgeon, F. D.—38.1.3
Pierce, E. S.—21.1.6
Pierson, R. M.—32.2.23, 32.2.25
Pines, A. N.—16.1.10
Pinner, R.—29.1.7, 29.1.8, 29.1.12, 29.1.13
Pizer, R. S.—37.7.3
Pocock, B. W.—37.7.1
Pocock, W. E.—29.1.9, 29.1.10
Pohl, H. A.—38.7.1
Polack, R. J.—20.2.6
Poll, Jr. G. H.—30.5.4
Pollack, M. A.—23.8.9
Polson, A. E.—8.5.1, 8.5.2
Port, W. S.—18.1.2, 25.7.9, 25.7.10
Porter, H. F.—34.5.1
Potnis, S. P.—21.1.1, 34.3.5
Powell, A. S.—21.1.7
Prakash, O.—4.1.14
Prane, J. W.—26.2.4
Pratt, B. C.—12.1.4
Preiser, H. S.—29.1.1
Preston, J. H.—16.1.9
Preuss, H.—1.2.28
Price, C. C.—9.1.5
Price, F. P.—16.1.24
Price, Jr., W. R.—21.3.4, 21.3.6
Priestley, Jr., W.—38.8.7
Pritchard, J. E.—18.1.3
Pufahl, A. E.—19.1.1, 25.7.1
Pund, H.—38.1.1
Puntambekar, S. V.—23.1.9
Pupil, F.—37.3.3

Q

Quackenbush, F. W.—23.5.1
Quarendon, R.—38.4.4, 38.4.5, 38.4.6
Quigley, Jr., F. K.—26.4.7

R

Rabate, H.—1.2.30
Ramanujam, S.—30.1.1—30.1.2
Rao, C. V. N—32.2.1
Rappaport, G.—11.1.2
Rasmussen, D. J.—22.1.6
Rathmann, G. B.—7.1.2, 7.1.4
Redfield, C. S.—25.7.10
Reed, V. D.—1.5.7
Rehak, J.—34.2.4
Reid, A. J.—16.1.12
Reid, E. F.—38.6.3
Reid, T. S.—7.1.1
Reinhart, J.—20.2.4
Reiss, H.—5.3.4
Renfrew, M. M.—27.1.2
Reno, J.—34.4.4
Resnick, A. L.—3.1.11
Rethwisch, F. B.—21.10.1
Reves, H. F.—30.2.12
Reymann, G. L.—27.3.17
Rhodes, M. S.—32.2.13
Rich, A. D.—23.1.14
Richards, L. M.—20.1.5
Richardson, C. B. W.—38.4.7
Richardson, S. H.—2.2.5
Riddle, E. H.—3.1.2, 25.7.7, 25.7.8
Ridenour, W. P.—24.10.1, 24.10.5, 24.10.6
Rideout, F. A.—18.4.2
Rinse, J.—24.1.2
Rishi, D. B.—32.2.1
Rittershausen, E. P.—22.2.2
Roberts, A. G.—37.7.3
Roberts, D. E.—8.1.9
Robinson, A. M.—27.11.1
Robson, A. H.—4.1.4
Robson, L. W.—21.2.4
Roche, A. F.—32.2.16
Rodes, T. W.—34.4.3
Rodriguez, F.—24.4.1
Roe, C. P.—24.5.3
Rogers, R. G.—38.1.12
Rose, D. G.—13.2.1
Rose, H. E.—21.9.1, 38.10.3
Rose, K.—16.1.2, 17.3.1
Rosen, M. J.—24.5.5
Ross, S. D.—2.1.9
Roth, H. H.—14.1.1
Rothbard, S.—30.4.4, 30.4.5
Rowe, R.—23.11.10, 23.11.12
Rubenstein, M.—22.1.3
Rubin, I. A.—30.6.2
Rudd, H. W.—22.4.3
Rudolph, W.—30.1.17
Rudram, A. T. S.—28.1.12
Ruffoni, A.—38.7.6
Ruggeri, S.—1.2.13
Rushton, J. H.—34.2.1
Russell, J.—5.3.5
Ryder, E. E.—8.1.5

S

Sag, N.—35.2.3
Sakornbut, S. S.—24.3.5
Saletore, S. A.—23.3.1
Sallans, H. R.—23.1.24
Salzberg, H. K.—24.8.1
Salzberg, P. L.—2.1.14
Samuels, R. J.—3.1.11
Sandberg, C. L.—7.1.2, 7.1.5
Sarin, K. K.—1.2.41
Sartori, M. F.—24.1.6
Sauer, J. C.—18.1.4
Saur, R. L.—37.3.5
Sayles, D. C.—1.5.2, 34.7.1
Scheifele, H. J.—34.3.10
Schenck, P. S.—21.3.5
Scherer, G. A.—38.4.12
Scherer, P. C.—38.5.6
Schleicher, M. E.—27.1.12, 27.3.15
Schmidt, C. A. H.—31.1.5
Schmitt, R. G.—38.7.4, 38.8.5
Schneid, A. F.—21.14.2
Schoon, T. G. F.—19.13.1
Schulman, J. H.—37.9.1
Schulz, G. V.—3.1.10
Schwahn, C. O.—1.2.6
Schwartz, R. T.—27.13.4
Schwarz, M.—2.1.9
Schweppe, J. L.—22.1.1
Scofield, F.—1.2.18, 38.3.4
Scott, D. W.—22.6.1
Seaborne, L. R.—4.1.15, 9.2.1
Seagren, G. W.—27.3.17
Seaman, W.—21.14.1
Seanor, R. C.—34.2.4
Seavell, A. J.—23.2.1
Segur, J. B.—25.3.5
Seitzer, W. H.—32.1.4
Selbe, R. L.—19.1.9
Seldin, I. L.—21.14.3
Sen, B.—25.4.2
Severs, E. T.—27.5.2
Seymour, R. B.—27.3.1, 27.3.8
Shaffer, R. H.—30.2.15
Shankweiler, F. K.—7.2.1
Sharpe, E. E. V.—30.3.2
Shavit, N. —2.1.4
Shaw, J. N.—38.1.4
Shechter, L.—4.4.1
Shelberg, W. E.—37.1.7
Sherman, L. R.—28.1.1
Shetye, G. D.—15.1.2
Shreeve, N. G.—27.7.3
Shreve, R. N.—4.3.1
Shur, E. G.—21.8.1, 21.8.2, 37.12.1
Sikkens, N. V.—27.10.1
Silberberg, A.—1.2.19
Silverstein, R. M.—20.1.5, 28.1.18
Simmons, R. O.—23.5.1
Sims, R. P. A.—23.1.23, 32.2.6
Singer, E.—23.8.4, 26.4.1, 26.4.2, 27.1.1, 27.1.3, 27.1.4, 27.1.5, 27.1.6, 28.1.6, 28.1.8, 28.1.14, 28.1.16, 28.1.17
Singer, E. J.—6.1.7
Sittig, M.—32.2.10
Sivasamban, M. A.—23.3.1, 23.3.4
Skellon, J. H.—32.3.2
Skett, A.—1.2.22
Slansky, P.—23.1.25
Sleightholme, J. J.—23.2.1
Slocombe, R. J.—18.1.5
Slowinski, Jr., E. J.—32.2.24
Smart, G. W.—35.4.3
Smets, G.—14.1.9, 32.2.21
Smith, D. J.—12.1.6
Smith, Jr., G. H.—7.1.1
Smith, P. G.—38.4.14
Smook, M. A.—13.3.1
Snodden, W. J.—8.1.7
Soano, A. H.—27.11.5
Sommer, L. H.—16.1.19, 16.1.20
Sones, R. H.—38.5.2
Sorenson, B. E.—11.2.2

Sorenson, D. P.—8.6.2
Sorenson, S. O.—26.4.7
Sourirajan, S.—5.4.3
Southby, C. A.—30.3.3
Spoerri, P. E.—21.14.3
Sprung, M. M.—18.8.1
Sreenivasan, B.—23.3.1
Stafford, R. W.—38.1.11, 38.7.4, 38.8.5
Stanners, J. F.—27.3.13
Stannett, V.—2.1.5
Starkweather, Jr., H. W.—17.2.2
St. Clair Gantz, E.—20.2.4
Stebleton, L. F.—16.1.17
Stedry, P. J.—7.1.6
Stein, R. S.—38.3.9
Stephenson, R. W.—22.4.2
Sternberg, L.—30.1.12
Stevens, R. D.—1.3.7, 1.3.8, 1.4.1, 1.4.2, 1.4.3, 1.4.4, 1.4.7
Stevens, R. E.—29.3.4
Stewart, G. T.—32.2.4
Stewart, F. S.—27.1.8
Stewart, J. A.—24.10.6
Stieg, F. B.—26.2.3
Stirton, A. J.—24.5.2
Stockbower, E. A.—29.2.4
Strong, A. K.—35.1.4
Struthers, R. D.—24.1.4
Stumpf, M. L.—24.4.2
Subba Rao, T. V.—9.1.2, 9.1.3, 23.3.1, 34.6.1
Suen, T. J.—9.2.2
Sugihara, J. M.—8.6.2
Sullivan, W. M.—28.3.1
Sussman, V.—6.1.5
Sutker, L. L.—23.11.3
Sutton, D. A.—24.10.2
Sverdrup, N. M.—35.4.2
Swain, R. C.—1.2.27
Swann, M. H.—38.7.8
Swanson, H.—30.4.3
Sweeney, W. T.—3.1.3
Swern, D.—18.1.2, 20.1.4, 25.7.10
Swinehart, R. W.—5.7.1
Szlachtun, A. J.—32.2.4

T

Taft, W. K.—8.1.5
Talen, H. W.—37.1.3
Talen, W. H.—27.3.13
Tanghe, L. J.—5.3.1
Tanner, D.—25.7.6
Tator, K.—26.5.1, 27.3.4
Tawn, A. R. H.—4.1.13
Taylor, J.—21.2.3
Taylor, J. H.—34.3.9
Taylor, R. S.—2.1.12
Taylor, W. I.—27.1.19
Teeter, H. M.—26.4.6
Terrill, R. L.—23.10.1
Terry, H.—19.4.1, 26.4.7
Tess, R. W.—2.2.4
Teyssie, P.—14.1.9
Thielsch, H.—27.13.2
Thirsk, J. H.—29.1.15
Thomas, B. B.—5.2.5
Thomas, G. A.—22.7.1
Thomas, J. M.—4.1.1
Thompson, L. J.—37.11.1, 37.11.2
Thomsen, S. M.—5.2.6
Tilley, G. P.—13.1.4
Tobolsky, A. V.—14.1.8, 32.1.4, 32.2.9, 32.2.18
Toeldte, W.—37.3.4
Tolberg, W.—12.1.2
Tompkins, N. G.—19.4.2, 28.1.1
Tragardi, K. F.—27.3.13
Trementozzi, Q. A.—3.1.4
Truden, F. A.—29.3.1
Tu, C.—5.3.2
Tucker, R. W.—14.1.2
Turner, J. H. W.—19.1.5, 19.1.6
Turner, W. R.—24.10.3
Tyler, L.—22.1.8

U

Uraneck, C. A.—32.2.15

V

Vaidya, M. R.—14.1.3
Valentine, L.—38.5.9
van der Bie, G. J.—19.13.1
VanLear, G. M.—16.1.8
VanLoo, M.—38.4.12
Vannoy, W. G.—26.4.5, 26.4.7
Van Rysselberge, M.—27.3.13
Vanstone, A. H.—27.3.9
Varawalla, I. S.—34.3.6
Villforth, Jr., F. J.—38.4.11
Vivona, D. N.—16.1.20
Von Fisher, W.—21.1.7
VonHippel, P. H.—9.1.4

W

Waddington, G.—22.6.1
Wadington, J. P.—24.13.3
Wadsworth, F. T.—8.1.11
Wagner, E. F.—24.4.3
Walker, H. P.—16.1.8
Walker, W. C.—34.3.9
Wall, L. A.—14.1.6
Wallace, C. R.—34.2.4
Wallder, V. T.—18.3.1
Walling, C.—32.2.7
Walsh, T. J.—24.4.1
Walter, L.—30.2.10, 31.1.1, 36.1.4
Walton, L.—31.2.1
Walton, W. T.—26.4.6
Wampler, R. H.—27.10.2
Ward, Jr., K.—5.3.2
Ward, S. G.—38.1.7
Warrick, E. L.—16.1.18
Wartman, L. H.—20.1.2, 24.8.2
Waterhouse, R. B.—37.9.1
Waterman, H. I.—11.2.1
Waters, G. W.—22.1.9, 22.1.10, 22.1.11, 22.1.12, 22.1.13, 22.2.1, 22.2.3, 22.2.4, 22.3.1, 26.4.7
Watson, B. M.—23.1.29
Watson, V.—21.6.1
Watt, J. J.—38.3.2
Watts, J. C.—27.3.3
Waugh, D. F.—9.1.4
Weatherford, Jr., W. D.—24.10.1
Weaver, G. L.—27.4.1
Weaver, J. B.—34.1.9 34.1.10
Weaver, J. W.—24.13.1, 24.13.2
Weeks, C. C.—19.14.1, 19.14.2
Weil, B. H.—8.1.5
Weinstein, A. H.—32.2.23
Weisberg, S. M.—28.1.19
Weisgerger, G. A.—18.1.7
Weissman, N.—34.1.11, 34.1.13
Wellman, N.—28.1.1
Wells, C. D.—19.2.1
Wells, G. A.—11.1.3
Welt, D. I.—30.4.1
Wendt, R. E.—24.4.3
Wernick, S.—29.1.7, 29.1.8, 29.1.12, 29.1.13
Werthan, S.—26.4.7, 37.1.5
Wesson, R. W.—35.1.3
West, P. W.—25.4.2
Wheeler, D. H.—23.1.18
Wheeler, O. L.—28.1.1
Wheeler, R. N.—6.1.9, 6.2.3, 6.2.4
Whitby, G. S.—32.2.3
White, A. F.—6.1.12
White, L. S.—21.2.2
Whitehill, L. N.—2.1.12, 9.1.7
Whitemore, L. E.—18.7.1
Whitnack, G. C.—20.2.4
Whyte, J. L.—1.4.6
Wicklatz, J. E.—8.1.4
Widmer, G.—9.1.8
Wijnands, P. H. W.—11.2.1
Wilhelmy, Jr., O.—23.1.20
Wilkinson, Jr., J. M.—25.7.9
Wilkinson, J. R.—14.1.12
Williams, H. L.—32.2.14, 32.2.17
Williams, I.—27.11.6
Williams, J. L.—38.4.2
Williams, W. W.—21.1.5
Wilson, G. R.—23.12.1
Wilson, I. V.—26.3.7
Wilson, J. D. C.—18.1.4
Wilson, J. E.—24.8.4
Wilson, P. J.—19.4.8
Wilson, R.—4.1.4
Winslow, F. H.—2.1.10
Winter, G.—27.3.12
Wise, R.—29.2.3
Witnauer, L. P.—18.1.2
Wittcoff, H.—12.1.2, 12.2.3, 27.1.2
Wittman, R. E.—27.13.4
Woestman, R. J.—18.2.1
Wolff, Jr., V. C.—9.1.5
Wood, E. H.—14.1.12
Woodbridge, R. J.—28.1.7
Wooder, L. G.—1.2.31, 1.2.32, 1.2.33, 1.2.34
Woodruff, H. C.—26.4.7
Woodward, A. E.—32.2.21
Wormald, G.—21.5.1
Wright, B. C.—30.2.1
Wright, P. D.—22.1.7
Wyart, J.—1.5.3
Wyder, C. G.—34.1.11, 34.1.13
Wyman, G. M.—21.14.3
Wynstra, J.—4.4.1

Y

Yager, W. A.—2.1.10
Yeager, C. C.—24.3.1
Yehle, E. A.—20.2.1
Yerger, E. A.—22.1.14
Yokel, S.—33.1.2
Yost, R. S.—9.3.1
Young, R. V.—27.1.24
Youngs, C. G.—23.1.24

Z

Zagar, W.—38.5.4
Zaheer, S. H.—23.3.1
Zettlemoyer, A. C.—24.2.2, 24.2.3, 34.3.9
Zimm, B. H.—14.1.7
Zonsveld, J. J.—6.4.1
Zweig, S.—27.5.5

SUPPLIERS OF RAW MATERIALS AND EQUIPMENT

A

Paul O. Abbe, Inc.
Little Falls, N. J.

Abbe Engineering Company
50 Church Street
New York 7, N. Y.

Acheson Colloids Company
Port Huron, Mich.

Acheson Dispersed Pigments Co.
2250 E. Ontario Street
Philadelphia 34, Pa.

Acme Shellac Products Co.
108 Blanchard Street
Newark 5, New Jersey

Adco Chemical Company
148 - 154 Rome Street
Newark 1, N. J.

Advance Solvents & Chemical Corporation
245 Fifth Avenue
New York 16, N. Y.

Alkydol Laboratories, Inc.
3242 South Fiftieth Ave.
Cicero 50, Ill.

Allied Asphalt & Mineral Corporation
217 Broadway
New York 7, N. Y.

Allied Research Products, Inc.
4004-06 E. Monument Street
Baltimore 5, Md.

Alsop Engineering Corporation
Milldale, Connecticut

Aluminum Company of America
Alcoa Building
Pittsburgh 19, Pa.

American Alkyd Industries
Broad & 14th Street
Carlstadt, N. J.

American Can Company
100 Park Avenue
New York, N. Y.

American Chemical Paint Company
Ambler, Pa.

American Cyanamid Company
30 Rockefeller Plaza
New York 20, N. Y.

American Mineral Spirits Company
155 E. 44th Street
New York 17, N. Y.

American Potash & Chemical Corp.
3030 West Sixth Street
Los Angeles 54, Calif.

American Research Corp.
Bristol, Conn.

American Zinc Sales Company
P.O. Box 327
Columbus 16, Ohio

Analytical Measurements, Inc.
585 Main Street
Chatham, N. J.

Anderson-Prichard Oil Corporation
Oklahoma City 2, Oklahoma

Ansbacher-Siegle Corporation
Rosebank, Staten Island, N. Y.

Ansul Chemical Company
Marinette, Wisconsin

Antara Chemicals
435 Hudson Street
New York 14, N. Y.

Archer Daniels Midland Company
2191 W. 110th Street
Cleveland 2, Ohio

Argus Chemical Corp.
633 Court Street
Brooklyn 31, N. Y.

Aries Laboratories, Inc.
270 Park Avenue
New York 17, N. Y.

Arizona Chemical Company
30 Rockefeller Plaza
New York 20, N. Y.

Armour Chemical Division
1355 West 31st Street
Chicago 9, Illinois

Arnold, Hoffman & Co., Inc.
370 North Street
Teterboro, N. J.

Aromatic Products, Incorporated
15 East 30th Street
New York 16, N. Y.

The Atlantic Refining Company
260 S. Broad Street
Philadelphia 1, Pa.

Atlas Electric Devices Company
4114 N. Ravenswood Avenue
Chicago 13, Ill.

Atlas Powder Company
Wilmington 99, Delaware

Aula Chemicals, Inc.
P.O. Box 494
714 Division Street
Elizabeth, N. J.

Automatic Transportation Company
101 W. 87th Street
Chicago 20, Ill.

Automotive Rubber Company, Inc.
12550 Beech Road
Detroit 39, Mich.

B

Baird Associates, Inc.
33 University Road
Cambridge, Mass.

Baird Chemical Corporation
254 West 31st Street
New York 1, N. Y.

Bakelite Company
300 Madison Avenue
New York 17, N. Y.

Baker Caster Oil Co.
120 Broadway
New York 5, N. Y.

Barber Asphalt Corp.
Barber, New Jersey

Bareco Oil Company
P.O. Box 2009
Tulsa, Oklahoma

Charles E. Barker Company
P.O. Box 85
Bladensburg, Maryland

Barksdale Company
921 Bergen Avenue
Jersey City 6, N. J.

H. L. Barnebey
P.O. Box 144
Pittsburgh 30, Pa.

Barrett Division
Allied Chemical & Dye Corp.
40 Rector Street
New York 6, N. Y.

Bausch & Lomb Optical Co.
Rochester 2, N. Y.

Beacon Printing Company, Inc.
42 Marshall St.
Newark, N. J.

Beltran Associates, Inc.
1133 East 35th Street
Brooklyn 10, N. Y.

Bennett Industries, Inc.
Peotone, Ill.

Berncolors, Inc.
Poughkeepsie, N. Y.

Bethlehem Foundry & Machine Company
Bethlehem, Penna.

Binks Manufacturing Company
3114 W. Carroll Ave.
Chicago 12, Illinois

Blackmer Pump Company
1809 Century, SW
Grand Rapids 9, Mich.

Blaw-Knox Company
P.O. Box 1198
Pittsburgh 30, Pa.

The Borden Company
Chemical Div.
350 Madison Avenue
New York 17, N. Y.

The Borden Company
Chemical Div.
Monomer Dept.
350 Madison Ave.
New York 17, N. Y.

The Borden Company
Chemical Div.
Polyco Dept.
350 Madison Ave.
New York 17, N. Y.

The Borden Company
Chemical Div.
Resinous-Reslac Dept.
350 Madison Ave.
New York 17, N. Y.

Bowser, Inc.
Fort Wayne 2, Indiana

W. H. Brady Company
727 West Glendale Avenue
Milwaukee 12, Wis.

Brazilian Industrial Oils
75 West St.
New York, N. Y.

Brazil Oiticica
80 Broad St.
New York 4, N. Y.

Brighton Copper Works, Inc.
820 State Ave.
Cincinnati, Ohio

Brookfield Engineering Laboratories, Inc.
250 Cushing Street
Stoughton, Mass.

The R. J. Brown Company
1418 Wittenberg Avenue
St. Louis 10, Mo.

Brown-Allen Chemicals, Inc.
Box 1, Port Richmond
Staten Island 2, N. Y.

The Buckeye Cotton Oil Company
Memphis 8, Tenn.

Buckman Laboratories, Inc.
Memphis 8, Tenn.

Buflovak Equipment Div.
Buffalo 11, N. Y.

E. D. Bullard Company
275 Eighth Street
San Francisco 3, Calif.

Burdett Manufacturing Company
3433 West Madison Street
Chicago 24, Illinois

Burgess Pigment Company
P.O. Box 145
Sandersville, Georgia

Burrell Corp.
2223 Fifth Ave.
Pittsburgh, Pa.

Burt Machine Company
Baltimore 2, Md.

The Burtonite Co.
Nutley 10, N. J.

C

Godfrey L. Cabot, Inc.
77 Franklin Street
Boston 10, Massachusetts

The California Ink, Inc.
545 Sansome St.
San Francisco, Calif.

Cambridge Industries
101 Potter St.
Cambridge 42, Mass.

Carbide and Carbon Chemicals Company
30 East 42nd Street
New York 17, N. Y.

Carbola Chemical Co.
Natural Bridge, N. Y.

Carbon Dispersions, Inc.
27 Haynes Avenue
Newark 5, N. J.

Cargill, Inc.
Veg. Oil Div.
200 Grain Exchange Bldg.
Minneapolis 15, Minn.

Carolina Aniline & Extract Co.
Charlotte, N. C.

Carrier Conveyor Corp.
Frankfort Avenue at Clifton Avenue
Louisville 6, Ky.

Cartrite International, Inc.
535 Fifth Avenue
New York 17, N. Y.

The Carwin Company
North Haven, Conn.

Catalytic Combustion Corp.
4544 Grand River Avenue
Detroit 8, Mich.

Celanese Corp. of America
Chemical Div.
180 Madison Ave.
New York 16, N. Y.

Celanese Corp. of America
Plastics Div.
290 Ferry Street
Newark 5, N. J.

Central Solvents & Chemicals Company
2545 West Congress Street
Chicago 12, Illinois

Central Soya Co., Inc.
Fort Wayne, Ind.

Chemical Prods. Corp.
P.O. Box 61
Little Falls, N. J.

Chemical Solvents, Inc.
60 Park Place
Newark 2, N. J.

Chemicolloid Laboratories Inc.
30 Church Street
New York 7, N. Y.

Chemirad Corp.
Laurel, Md.

Ciba Company Inc.
627 Greenwich Street
New York 14, N. Y.

Claremont Pigment Dispersion Corp.
39 Powerhouse Rd.
Roslyn Hts., L. I. N. Y.

Clark Equipment Company
Battle Creek, Mich.

The Cleveland Steel Barrel Company
9612 Meech Avenue
Cleveland 5, Ohio

The Colton Chemical Company
1545 East 18th Street
Cleveland 14, Ohio

Columbian Carbon Company
380 Madison Ave.
New York, N. Y.

Colwell Color Cards
501 S. Sixth St.
Minneapolis, Minn.

Combustion Engineering, Inc.
1315 N. Branch Street
Chicago 22, Ill.

Commercial Solvents Corporation
260 Madison Avenue
New York 16, N. Y.

Conforming Matrix Corp.
Toledo Factories Bldg.
Toledo 2, Ohio

Concord Mica Corp.
35 Crescent Street
Penacook, N. H.

Conn and Co.
11 South Marion Street
Warren, Pennsylvania

Conrad, Inc.
141 Jefferson
Holland, Michigan

Continental Can Company, Inc.
100 East 42nd Street
New York 17, N. Y.

Continental Carbon Co.
122 E. 42nd St.
New York 17, N. Y.

Corn Products Sales Co.
New York, N. Y.

Corrosion Control Co., Inc.
516 Fifth Avenue
New York 36, N. Y.

Cosden Petroleum Corporation
P.O. Box 1311
Big Spring, Texas

Cowles Chemical Company
7016 Euclid Ave.
Cleveland 3, Ohio

Craddock Equipment Co., Inc.
1507 A Street
Wilmington, Del.

Croda, Inc.
51 Madison Avenue
New York 10, N. Y.

Crosby Chemicals, Inc.
Box 111
Picayune, Miss.

Crown Can Co.
H St. & Erie Ave.
Philadelphia, Pa.

Crown Engineering & Sales Co.
421 Hill Street
Harrison, N. J.

Crownoil Chemical Co., Inc.
2-14 49th Avenue
Long Island City 1, N. Y.

The Cuno Engineering Corporation
Meriden, Connecticut

Cuprinol Division
Darworth Incorporated
Simsbury, Conn.

D

The Dacar Chemical Products Company
McCartney at Wabash Street
West End
Pittsburgh 20, Pa.

Davies Can
8007 Grand Ave.
Cleveland 4, Ohio

The Davison Chemical Corporation
Baltimore 3, Maryland

The J. H. Day Company, Inc.
Cincinnati 22, Ohio

Delaware Chemicals, Inc.
P.O. Box 1772
Wilmington, Del.

Delou, Inc.
20-22 Fletcher Street
New York 38, N. Y.

The Denison Engineering Company
1160 Dublin Road
Columbus 16, Ohio

Despatch Oven Company
619 S.E. Eighth Street
Minneapolis 14, Minnesota

Detrex Corporation
Box 501
Detroit 32, Michigan

The DeVilbiss Company
Toledo 1, Ohio

Dewey & Almy Chemical Co.
Cambridge 40, Mass.

Diamond Alkali Company
300 Union Commerce Building
Cleveland 14, Ohio

Distillation Products Industries
Rochester 3, N. Y.

Dodge & Olcott, Inc.
180 Varick Street
New York 14, N. Y.

The Dow Chemical Company
Midland, Mich.

Dow Corning Corp.
Midland, Mich.

Doyle Vacuum Cleaner Co.
242 Stevens St. S. W.
Grand Rapids 2, Mich.

Drage Products
406 32nd Street
Union City, N. J.

Dri-Flo Mfg. Company
642 East Ten Mile Road
Hazel Park, Mich.

Dry Ice Converter Corporation
Box 1652
Tulsa, Oklahoma

The DuBois Co. Inc.
Cincinnati 3, Ohio

E. I. duPont de Nemours & Company
Electrochemicals Dept.
Pigments-Color
White
Wilmington 98, Del.

Dura Commodities Corporation
20 Vesey Street
New York 7, N. Y.

Durez Plastics & Chemicals, Inc.
North Tonawanda, New York

E

The Eagle-Picher Company
Cincinnati 1, Ohio

J. S. & W. E. Eakins, Inc.
55 Berry St.
Brooklyn, N. Y.

Eastern Industries, Inc.
Mixer Division
East Norwalk, Connecticut

Eastern States Chemical Corporation
8938 Manchester Avenue
Houston 12, Texas

Eastmen Chemical Products, Inc.
Kingsport, Tennessee

Eco Engineering Company
12 New York Avenue
Newark 1, N. J.

Thomas A. Edison, Inc.
West Orange, N. J.

El Dorado Oil Works
311 California St.
San Francisco, Calif.

The Elwell-Parker Electric Company
50 Church Street
New York 7, N. Y.

Emerson & Cuming, Inc.
869 Washington Street
Canton, Mass.

Emery Industries, Inc.
Carew Tower
Cincinnati 2, Ohio

The Emulsol Corporation
59 East Madison Street
Chicago 3, Illinois

The English Mica Company
79 Prospect Street
Stamford, Conn.

Enjay Company, Inc.
15 West 51st Street
New York 19, N. Y.

Enthone Incorporated
442 Elm Street
New Haven, Conn.

Esso Standard Oil Company
15 West 51st Street
New York 19, N. Y.

Ethyl Corporation
100 Park Avenue
New York 17, N. Y.

F

Fallek Products Company, Inc.
165 Broadway
New York 6, N. Y.

Falls Industries, Inc.
Aurora Road
Solon, Ohio

Farnow, Inc.
4-80 47th Road
Long Island City 1, N. Y.

Federal Latex Corporation
210-220 Wythe Avenue
Brooklyn 11, N. Y.

Fein's Tin Can Co., Inc.
50th Street & 1st Ave.
Brooklyn, N. Y.

Ferro Corporation
4150 East 56th Street
Cleveland 5, Ohio

Filpaco Industries, Inc.
2463 South Michigan Avenue
Chicago 16, Ill.

Fine Colors Company
21-29 McBride Avenue
Paterson, N. J.

Finish Engineering Co., Inc.
1115 Cherry Street
Erie, Pa.

Firestone Plastics Company
P.O. Box 690
Pottstown, Pa.

Fisher Scientific Company
717 Forbes Street
Pittsburgh 19, Pa.

Florida Molasses Corporation
P.O. Box 366
Auburndale, Florida

Foster Pump Works, Inc.
50 Washington Street
Brooklyn, N. Y.

The Fostoria Pressed Steel Corporation
Fostoria, Ohio

France, Campbell & Darling, Inc.
Kenilworth, N. J.

Franklin Mineral Products Company
Franklin, North Carolina

Fritzsche Brothers, Inc.
76 Ninth Avenue
New York 11, N. Y.

Fuller Company
Catasauqua, Pa.

Furane Plastics, Inc.
4516 Brazil Street
Los Angeles 39, Calif.

G

Gabb Special Products
Windsor Locks, Conn.

Gallowhur Chemical Corporation
N. Water St.
Ossining, N. Y.

Gardner Laboratory Inc.
4723 Elm Street
Bethesda 14, Md.

Geigy Industrial Chemicals
89 Barclay Street
New York 8, N. Y.

General Aniline & Film Corporation
435 Hudson St.
New York 14, N. Y.

General Carbon Company
7542 Maie Ave.
Los Angeles 1, Calif.

General Ceramics Corporation
Keasbey, N. J.

General Color Company
24 Avenue B
Newark 5, N. J.

General Dyestuff Corporation
435 Hudson Street
New York 14, N. Y.

General Electric Company
Chemical Materials Dept.
77 River Rd.
Schenectady, N. Y.

General Latex & Chemical Corp.
666 Main Street
Cambridge 39, Mass.

General Mills, Inc.
Chemical Division
South Kensington Road
Kankakee, Ill.

The General Tire & Rubber Co.
Chemical Division
Akron, Ohio

Georgia Kaolin Co.
435 N. Broad St.
Elizabeth, N. J.

Geuder Paeschke & Frey Co.
324 N. 15th St.
Milwaukee 1, Wisconsin

Gillespie-Rogers-Pyatt Co. Inc.
75 West Street
New York 6, N. Y.

The Girdler Company
Louisville 1, Kentucky

Givaudan-Delawanna, Inc.
330 West 42nd Street
New York 36, N. Y.

The Glidden Company
Naval Stores Division
P.O. Box 389
Jacksonville 1, Florida

The Glidden Company
Chemicals-Pigments-Metals Division
1396 Union Commerce Building
Cleveland 14, Ohio

Glycerine Corp. of America
36 W. 44 St.
New York, N. Y.

Glyco Products Co., Inc.
Empire State Bldg.
New York 1, N. Y.

B. F. Goodrich Chemical Co.
Rose Bldg.
2060 E. Ninth St.
Cleveland 15, Ohio

The Goodyear Tire & Rubber Co., Inc.
Chemical Division
Akron 16, Ohio

Goulds Pumps, Inc.
Seneca Falls, N. Y.

Great Lakes Carbon Corporation
Dicalite Div.
612 South Flower Street
Los Angeles 17, Calif.

The Emil Greiner Company
20-26 N. Moore Street
New York 13, N. Y.

The Griffith Laboratories
1415 W. 37th Street
Chicago 9, Ill.

A. Gross & Co.
295 Madison Ave.
New York 17, N. Y.

The G. S. Equipment Company
5317 St. Clair Avenue
Cleveland 3, Ohio

Guardian Chemical Corp.
10-15 43rd Avenue
Long Island City 1, N. Y.

The Greif Bros. Cooperage Corporation
Cleveland 13, Ohio

Gulf Oil Corporation
17 Battery Place
New York 4, N. Y.

H

Wm. J. Hacker & Co., Inc.
82 Beaver Street
New York 5, N. Y.

Alfred Hague & Co. Inc.
227d - 34th Street
Brooklyn 32, N. Y.

Hansborg & Company
P.O. Box 152
80 Longview Road
Port Washington, L. I., N. Y.

Harchem Division
Wallace & Tiernan, Inc.
Box 178
Newark 1, N. J.

Harding Company, Inc.
York, Pennsylvania

Charles J. Hardy, Inc.
420 Lexington Ave.
New York, N. Y.

The Harshaw Chemical Co.
1945 East 97th Street
Cleveland 6, Ohio

Harwick Standard Chemical Company
60 South Seiberling Street
Akron 5, Ohio

Hayden Mica Company
Wilmington, Massachusetts

Hayes Adhesives Co., Inc.
630 W. 51st Street
New York 19, N. Y.

Hellige, Inc.
Garden City, N. Y.

Hercules Powder Company
Wilmington 99, Delaware

Herman Hockmeyer & Co.
341 Coster Street
New York 59, N. Y.

Hermas Machine Company Inc.
225 Warburton Avenue
Hawthorne, N. J.

Heyden Chemical Corporation
342 Madison Avenue
New York 17, N. Y.

Hinde & Dauch
Sandusky, Ohio

Holland Colors & Chemical Company
Holland, Michigan

Hooker Electrochemical Company
Niagara Falls, N. Y.

The Hopkins Company
150 Nassau Street
New York 38, N. Y.

Howards & Sons (Canada) Ltd.
247 Dunbar Avenue
Montreal, Quebec

J. M. Huber Corporation
100 Park Avenue
New York 17, N. Y.

Humphrey-Wilkinson, Inc.
North Haven, Conn.

Hy-R-Speed, Inc.
3135 Casitas Avenue
Los Angeles 39, Calif.

I

Imperial Paper and Color Corporation
Glens Falls, N. Y.

Indoil Chemical Company
910 South Michigan Avenue
Chicago 80, Ill.

Industrial Filter & Pump Mfg. Co.
5900 Ogden Avenue
Chicago 50, Illinois

Industrial Ovens, Inc.
13825 Triskett Road
Cleveland 11, Ohio

Industrial Products Company
2820 N. Fourth Street
Philadelphia 33, Pa.

Industrial Radiant Heat Corp.
P.O. Box 123
Gladstone, N. J.

Ingersoll-Rand Company
Phillipsburg, N. J.

Inland Steel Company
38 South Dearborn Street
Chicago 3, Ill.

O. G. Innes Corporation
82 Wall Street
New York 5, N. Y.

Innes, Speiden & Co. Inc.
420 Lexington Avenue
New York 17, N. Y.

Interchemical Corporation
67 W. 44th St.
New York, N. Y.

International Engineering, Inc.
Dayton 1, Ohio

International Wax Refining Corp.
E. Hawthorne Avenue
Valley Stream, N. Y.

Isocyanate Products, Inc.
P.O. Box 1681
Wilmington, Delaware

J

Jefferson Chemical Company Inc.
260 Madison Ave.
New York 16, N. Y.

Johns-Manville
22 East 40th Street
New York 16, N. Y.

Jones-Dabney Company
Louisville, Ky.

K

Kay-Fries Chemicals, Inc.
180 Madison Avenue
New York 16, N. Y.

The M. W. Kellogg Company
Jersey City 3, N. J.

The C. M. Kemp Mfg. Co.
405 East Oliver Street
Baltimore 2, Md.

Kenrich Corp.
57-02 48th Street
Maspeth 78, N. Y.

Kent Machine Works, Inc.
37-39-41 Gold Street
Brooklyn 1, N. Y.

Kentucky Color and Chemical Co.
600 North 34th Street
Louisville 12, Ky.

Walter Kidde & Co., Inc.
Belleville 9, N. J.

The Karl Kiefer Machine Company
Cincinnati 2, Ohio

Kinetic Dispersion Corporation
95 Botsford Place
Buffalo 16, N. Y.

Klem Chemicals, Inc.
14401 Lanson Avenue
Dearborn, Mich.

George Koch Sons, Inc.
P.O. Box 358
Evansville 4, Indiana

H. Kohnstamm & Co., Inc.
83-93 Park Pl.
New York 7, N. Y.

Kolker Chemical Works, Inc.
80 Lister Avenue
Newark 5, N. J.

Koppers Company, Inc.
Chemical Division
Pittsburgh 19, Pa.

Kosmos Electro-Finishing Research, Inc.
13 Valley Street
Belleville, N. J.

Kraft Chemical Company, Inc.
917 West 18th Street
Chicago 8, Illinois

Krumbhaar Chemicals, Inc.
24-30 Jacobus Avenue
South Kearny, N. J.

The Kwerel Company
161 Crescent Court
Englewood, N. J.

L

Lee Metal Products Co., Inc.
Philipsburg, Pa.

Leeds & Northrup Company
4907 Stenton Avenue
Philadelphia 44, Pa.

J. M. Lehmann Company, Inc.
550 New York Avenue
Lyndhurst, N. J.

Linde Air Products Company
30 E. 42nd Street
New York 17, N. Y.

Lindquist Pump Corp. of Texas
2207 Border Avenue
Torrance, Calif.

Liquid Carbonic Corp.
3100 S. Kedzie Ave.
Chicago 23, Ill.

C. W. Logeman Company
633 Bergen Street
Brooklyn 17, N. Y.

The Lunkenheimer Company
405 Lexington Avenue
New York 17, N. Y.

M

Macbeth Corp. & Subsidiaries
Newburgh, N. Y.

Magna Manufacturing Co., Inc.
Haskell, New Jersey

Magnus, Mabee & Reynard, Inc.
16 Desbrosses Street
New York 13, N. Y.

Mallinckrodt Chemical Works
Second & Mallinckrodt Sts.
St. Louis 7, Mo.

Manton-Gaulin Manufacturing Co., Inc.
44 Garden Street
Everett 49, Massachusetts

Marathon Corporation
Chemical Division
Rothschild, Wis.

The Marblette Corporation
37-21 30th Street
Long Island City 1, N. Y.

Marbon Chemical Division
Borg-Warner Corp.
1926 West Tenth Avenue
Gary, Indiana

Marco Company, Inc.
Third & Church Streets
Wilmington 50, Del.

Market Forge Company
Everett 49, Mass.

Marlow Pumps
Box 566
Ridgewood, N. J.

Matherson-Selig Co.
1815 North Central Park Avenue
Chicago, Illinois

McCloskey Varnish Co.
Philadelphia 36, Pa.

McDanel Refractory Porcelain Co.
Beaver Falls, Pennsylvania

The McGeon Chemical Co.
1040 Midland Bldg.
Cleveland 15, Ohio

The Mead Corporation
Chillicothe, Ohio

M & E Manufacturing Company
2571 Winthrop Ave.
Indianapolis 5, Indiana

The Mercury Manufacturing Company
4044 South Halsted Street
Chicago 9, Ill.

Merkle-Korff Gear Company
213 N. Morgan Street
Chicago 7, Ill.

Metal & Thermit Corporation
100 East 42nd Street
New York 17, N. Y.

Metalead Products Corporation
2901 Park Blvd.
Palo Alto, Calif.

Metals Disintegrating Company Inc.
Elizabeth (B), New Jersey

Metalsalts Corporation
200 Wagaraw Road
Hawthorne, N. J.

Metalwash Machinery Corporation
938 N. Avenue
Elizabeth 4, N. J.

Metasap Chemical Company
Harrison, N. J.

Michigan Oven Company
415 Brainard Street
Detroit 1, Mich.

Franklin P. Miller & Son, Inc.
36 Meadow Street
East Orange 13, N. J.

Mine Safety Appliances Company
201 N. Braddock Avenue
Pittsburgh 8, Pa.

Mineral Pigments Corporation
Muirkirk, Maryland

Mineralite Sales Corporation
90 Pine Street
New York 5, N. Y.

Minerals & Chemicals Corporation of America
Menlo Park, N. J.

Minnesota Mining & Manufacturing Company
900 Fauquier Avenue
St. Paul 6, Minnesota

The Miskella Infra-red Company
East 73rd and Grand Avenue
Cleveland 4, Ohio

The Mitchell-Bradford Chemical Company
2446 Main Street
Stratford, Conn.

Mitchell Industrial Tire Co., Inc.
P.O. Box 468
Chattanooga, Tenn.

Mixing Equipment Co., Inc.
135 Mt. Read Boulevard
Rochester 11, N. Y.

Mona Industries, Inc.
Paterson 4, N. J.

Monsanto Chemical Co.
Plastics Division
Springfield, Mass.

Monsanto Chemical Company
St. Louis, Mo.

Mooney Chemicals, Inc.
2271 Scranton Road
Cleveland 13, Ohio

John B. Moore Corporation
Nutley 10, N. J.

Morehouse Industries
1150 San Fernando Road
Los Angeles 65, Calif.

Morningstar, Nicol, Inc.
630 West 51st Street
New York 19, N. Y.

Morse Mfg. Co., Inc.
727 W. Manlius Street
E. Syracuse, N. Y.

MRM Co., Inc.
191-3 Berry Street
Brooklyn 11, N. Y.

Mutual Chemical Co. of America
Block & Willis Sts.
Baltimore 31, Md.

N

Naftone, Inc.
515 Madison Avenue
New York 22, N. Y.

Naresco Equipment Corporation
160 Charlemont Street
Newton Highlands 61, Mass.

Narmco Resins & Coatings Company
600 Victoria Street
Costa Mesa, Calif.

National Aniline Division
Allied Chemical & Dye Corp.
40 Rector Street
New York 6, N. Y.

National Can Corp.
3217 W. 47th Place
Chicago 47, Ill.

National Equipment Corporation
153-7 Crosby Street
New York 12, N. Y.

National Foam System, Inc.
W. Chester, Pa.

National Lead Company
111 Broadway
New York 6, N. Y.

National Polychemicals, Inc.
Eames Street
Wilmington, Mass.

National Starch Prods., Inc.
270 Madison Avenue
New York 16, N. Y.

National Wax Company
1300 West Division Street
Chicago 22, Illinois

National Zinc Company, Inc.
Bartlesville, Okla.

Naugatuck Chemical
Naugatuck, Conn.

Nelson Chemical Company
6564 Benson Street
Detroit 7, Mich.

Neptune Meter Company
19 W. 50th Street
New York 20, N. Y.

Neville Chemical Company
Pittsburgh 25, Pa.

New England Tank & Tower Company
Everett, Massachusetts

The New Jersey Zinc Company
160 Front Street
New York 38, N. Y.

Newport Industries, Inc.
230 Park Ave.
New York 17, N. Y.

The New York Air Brake Company
1100 East 222nd Street
Cleveland 17, Ohio

New York Color & Chemical Co.
Belleville 9, N. J.

Ninol Laboratories
1719 South Clinton Street
Chicago 16, Ill.

Nitrogen Division
Allied Chemical & Dye Corp.
40 Rector Street
New York 6, N. Y.

Nopco Chemical Co., Inc.
Harrison, N. J.

Norcross Corp.
Newton 58, Mass.

Northwest Chemical Company
9310 Roselawn
Detroit 4, Mich.

North American Electric Lamp Co.
1014 Tyler St.
St. Louis 6, Mo.

Nova Chemical Corporation
147-153 Waverly Place
New York 14, N. Y.

Nuodex Products Co., Inc.
Elizabeth, N. J.

Nutting Truck and Caster Company, Inc.
Faribault, Minnesota

Oakite Products, Inc.
19 Rector Street
New York 6, N. Y.

Ohio-Apex Division
Food Machinery & Chemical Corp.
Nitro, West Virginia

O

Olin Mathieson Chemical Corp.
Mathieson Bldg.
Baltimore 3, Md.

Onyx Oil & Chemical Company
Warren & Morris Sts.
Jersey City 2, N. J.

The OP-AL Electric & Manufacturing Co.
809 N. Senate Ave.
Indianapolis 2, Indiana

Oronite Chemical Company
200 Bush St.
San Francisco, Calif.

C. J. Osborn Company
132 Nassau Street
New York 7, N. Y.

Ovens For Industry, Inc.
2032 W. 105th Street
Cleveland 2, Ohio

P

Pacific Coast Borax Co.
630 Shatto Place
Los Angeles 5, Calif.

The Pacific Lumber Company
100 Bush Street
San Francisco, Calif.

Pacific Vegetable Oil Corp.
3135 E. 26th Street
Los Angeles, Calif.

Paisley Products, Inc.
630 W. 51st Street
New York 19, N. Y.

Pan American Chemical Div.
122 East 42nd Street
New York 17, N. Y.

M. W. Parsons-Plymouth, Inc.
55 Beekman St.
New York 38, N. Y.

Parker Rust Proof Company
Detroit 11, Mich.

The Patterson Foundry & Machine Company
East Liverpool, Ohio

The Patterson-Kelly Co., Inc.
Warren Street
East Stroudsburg, Pa.

Peerless Color Company, Inc.
521-535 North Avenue
Plainfield, N. J.

Pelron Corp.
7740 W. 47th Street
Lyons, Illinois

Penetray Corporation
615 Front Street
Toledo 5, Ohio

The Pennebacker Company
Emmaus, Pennsylvania

Pennsylvania Color & Chemical Co.
Pine Run Road
Doylestown, Pa.

Penn. Ind. Chem. Corp.
Clairton, Pa.

Pennsylvania Refining Company
Butler, Pa.

Pennsylvania Salt Manufacturing Co.
1000 Widener Bldg.
Philadelphia 7, Pa.

The Perkin-Elmer Corporation
Norwalk, Connecticut

Petrochemicals Company
1825 E. Spring Street
Long Beach 6, Calif.

Petroleum Specialties Company
4030 Chouteau Avenue
St. Louis 10, Missouri

Petrolite Corp., Ltd.
30 Broad Street
New York 4, N. Y.

The Pfaudler Co.
1000 West Avenue
Rochester 3, N. Y.

Pfister Chemical Wks.
Ridgefield, N. J.

Chas. Pfizer & Co., Inc.
630 Flushing Avenue
Brooklyn 6, N. Y.

Philadelphia Pump & Machinery Co., Inc.
Philadelphia, Pa.

Philadelphia Quartz Company
Public Ledger Building
Philadelphia 6, Pa.

Phillips Petroleum Company
Special Products Division
Bartlesville, Oklahoma

Photovolt Corp.
95 Madison Ave.
New York 16, N. Y.

Pittsburgh Coke and Chemical Company
Grant Building
Pittsburgh 19, Pa.

Plaskon
Barrett Div.
Allied Chemicals Dye Corp.
40 Rector St.
New York, N. Y.

Plastics Color Company
233 Broad Street
Summit, N. J.

The Polymer Corp. of Pa.
Reading, Pa.

Popper & Sons, Inc.
300 Fourth Ave.
New York 10, N. Y.

The Pormix Corporation
2 Oak Ridge Street
Greenwich, Connecticut

Porous Plastic Filter Company
Glen Cove, N. Y.

Pressed Steel Tank Company
West Allis Station
Milwaukee, Wis.

Process Eng. & Mach. Company
Elizabeth, N. J.

Procter & Gamble
Cincinnati 1, Ohio

Promat Division
Poor & Company
851 South Market Street
Waukegan, Ill.

The Protectoseal Company
1920 South Western Avenue
Chicago 8, Illinois

Publicker Industries, Inc.
1429 Walnut Street
Philadelphia 2, Pa.

Pulverizing Machinery Company
Chatham Road
Summit, N. J.

Pyrene-C-O-Two
P.O. Box 390
Newark 1, N. J.

The Quaker Oats Company
Merchandise Mart Plaza
Chicago 54, Illinois

R

RAM Chemicals
200 E. Olive Street
Gardena, Calif.

Ransburg Electro-Coating Corp.
Barth & Saunders Sts.
Indianapolis 7, Indiana

N. Ransohoff, Inc.
North Fifth St. at Ford Blvd.
Hamilton, Ohio

The Rapids-Standard Company, Inc.
Rapistan Bldg.
Grand Rapids 2, Mich.

Raybo Chemical Company
Huntington, West Virginia

The Raymond Corporation
Greene, N. Y.

R-B-H Dispersions
Interchemical Corp.
Bound Brook, New Jersey

Read Standard Corporation
Bakery Chemical Division
York, Pa.

Reichard-Coulston, Inc.
15 East 26th Street
New York 10, N. Y.

Reichhold Chemicals, Inc.
525 North Broadway
White Plains, N. Y.

Reilly Tar & Chemical Corporation
Merchants Bank Bldg.
Indianapolis 4, Indiana

Revolvator Company
North Bergen, N. J.

Reynolds Metals Company
Richmond, Virginia

Rhode Island Laboratories, Inc.
West Warwick, R. I.

Rhodia, Inc.
230 Park Avenue
New York 17, N. Y.

Sid Richardson Carbon Company
Fort Worth Club Bldg.
Fort Worth, Texas

W. C. Ritchie & Company
8802 Baltimore Avenue
Chicago 17, Ill.

H. H. Robertson Company
Pittsburgh, Pa.

Rohm & Haas Company
Washington Square
Philadelphia 5, Pa.

Charles Ross & Son Company
148-156 Classon Avenue
Brooklyn 5, N. Y.

Frank B. Ross Co., Inc.
Jersey City 4, N. J.

Ross & Rowe
50 Broadway
New York 4, N. Y.

Milton Roy Company
75 West Street
New York 6, N. Y.

Rubber Corp. of America
New South Road
Hicksville, L. I., N. Y.

S

St. Joseph Lead Company
250 Park Avenue
New York 17, N. Y.

Schenectady Varnish Co.
200 Congress Street
Schenectady 1, N. Y.

Claude B. Schneible Company
P.O. Box 81, North End Station
Detroit 2, Michigan

Schutte and Koerting Company
Cornwells Heights
Bucks County, Pa.

Schutz-O'Neill Company
307 Portland Avenue
Minneapolis 15, Minn.

Scientific Oil Compounding Co., Inc.
1637 South Kilbourn Avenue
Chicago 23, Ill.

Selas Corp. of America
Dresher, Pa.

Semet-Solvay Petrochemical Division
Allied Chemical & Dye Corp.
40 Rector Street
New York 6, N. Y.

Sharples Chemicals Inc.
1100 Widener Bldg.
Philadelphia 7, Pa.

Shawinigan Resins Corp.
P.O. Box 2130
Springfield 2, Mass.

Shell Chemical Corporation
380 Madison Avenue
New York 17, N. Y.

Shell Oil Company
50 W. 50th St.
New York 20, N. Y.

The Shepherd Chemical Co.
2803 Highland Avenue
Cincinnati 12, Ohio

Sherwin-Williams Company
115th Street & Cottage Grove Avenue
Chicago 28, Ill.

Silberline Mfg. Co., Inc.
Stamford, Conn.

Sill Industries
187 Maplewood Avenue
Maplewood, N. J.

Sinclair Chemicals, Inc.
6 East 45th Street
New York 17, N. Y.

Sindar Corporation
330 West 42nd Street
New York 36, N. Y.

Skelly Oil Company
605 West 47th Street
Kansas City 41, Missouri

Smico Inc.
25 NE 26th
Oklahoma City, Okla.

J. Lee Smith & Co.
22 Ann Street
New York 38, N. Y.

Smith Chemical & Color Co.
55 John Street
Brooklyn 1, N. Y.

Snyder Chemical Corporation
Bethel, Connecticut

Socony-Vacuum Oil Company
26 Broadway
New York 4, N. Y.

Solar Compounds Corp.
Linden, N. J.

Solvay Process Division
Allied Chemical & Dye Corp.
61 Broadway
New York 6, N. Y.

Solvents & Chemicals Group
2540 Fluornoy St.
Chicago 12, Ill.

Southern Electric Products
P.O. Box 406
Anderson, S. Car.

Sparkler Manufacturing Co.
Mundelein, Illinois

Sparta Industries
Station Road
Sparta, New Jersey

Spencer Kellogg and Sons, Inc.
Buffalo 5, N. Y.

D. R. Sperry & Company
808 Nepperhan Avenue
Yonkers, N. Y.

H. C. Spinks Clay Company Inc.
Paris, Tennessee

Standard Oil Company of Ohio
Cleveland, Ohio

Standard Ultramarine & Color Co.
Huntington, West Virginia

Star Welding & Mfg. Co., Inc.
1052-60 E. 134th Street
Cleveland 10, Ohio

K. A. Steel Chemicals Inc.
7450 Stony Island Avenue
Chicago 49, Ill.

Stein, Hall & Company, Inc.
285 Madison Ave.
New York, N. Y.

The Stepan Chemical Company
20 North Wacker Drive
Chicago 6, Illinois

Stephens-Adamson Mfg. Co.
Aurora, Ill.

The Stevenson Company
225-227 N. Wilkinson Street
Dayton 2, Ohio

Fred'k A. Stresen-Reuter, Inc.
2113 Medill Avenue
Chicago 47, Ill.

Stewart-Warner Corporation
1826 Diversey Parkway
Chicago 14, Ill.

Sturtevant Mill Company
2 Harrison Square
Boston 22, Mass.

The Sulzer-Waegner Co.
P.O. Box 703
Montvale, N. J.

Sun Oil Company
Philadelphia 3, Pa.

Sun Supply Company
10th Street & 44th Avenue
Long Island City 1, N. Y.

The Surety Rubber Company
Carrollton, Ohio

Swenson Associates
19120 W. McNichols Road
Detroit 19, Michigan

Swift & Company
1800 165th Street
Hammond, Indiana

Synthetic Chemicals Inc.
335 McClean Blvd.
Patterson, N. J.

Synthetic Products Company
1636 Wayside Road
Cleveland 12, Ohio

Syntron Company
Homer City, Pa.

Synvar Corporation
Wilmington, Delaware

T

Tamms Industries, Inc.
228 N. La Salle Street
Chicago 1, Ill.

Tennessee Products & Chemical Corporation
350 Fifth Avenue
New York 1, N. Y.

N. J. Thermex Co., Inc.
533 Bergen Street
Harrison, N. J.

The Thibaut & Walker Co., Inc.
150 Rome Street
Newark 1, N. J.

Thiokol Corporation
Trenton 7, New Jersey

Titanium Pigment Corporation
111 Broadway
New York 6, N. Y.

Towmotor Corporation
1226 E. 152nd Street
Cleveland 10, Ohio

Triangle Chemical Company
Foot of Elm Street
Macon, Georgia

Tri-Homo Corporation
Salem, Massachusetts

The Trippe Manufacturing Company
218 N. Jefferson Street
Chicago 6, Ill.

Troy Chemical Company
2589 Frisby Avenue
New York 61, N. Y.

Troy Engine & Machine Co.
Troy, Pennsylvania

Turbo-Mixer
380 Madison Avenue
New York 17, N. Y.

U

Ultra Chemical Works, Inc.
Wood & Shady Streets
Paterson, N. J.

Ultrasonic Engineering Co.
P.O. Box 46
Maywood, Illinois

Union Bag & Paper Corporation
233 Broadway
New York 7, N. Y.

Union Bay State Chemical Co., Inc.
491 Main Street
Cambridge 42, Mass.

United Carbon Company, Inc.
Charleston 27, West Virginia

United States Bronze Powder Works, Inc
220 West 42nd Street
New York 36, N. Y.

U. S. Electrical Motors Inc.
Box 2058 Terminal Annex
Los Angeles 54, Calif.

U. S. Industrial Chemicals Company
99 Park Avenue
New York 16, N. Y.

U. S. Mica Company, Inc.
Jordan and VanDyke Streets
East Rutherford, N. J.

United States Steel Corporation
525 William Penn Place
Pittsburgh 30, Pa.

United States Steel Products
30 Rockefeller Plaza
New York 20, N. Y.

The U. S. Stoneware Company
Akron 9, Ohio

U. S. Testing Co., Inc.
1415 Park Avenue
Hoboken, N. J.

Universal Aviation Equipment, Inc.
362 Fifth Ave.
New York 1, N. Y.

Universal Chemicals Corporation
Lonsdale, R. I.

V

van Ameringen-Haebler, Inc.
521 West 57th Street
New York 19, N. Y.

R. T. Vanderbilt Co., Inc.
230 Park Avenue
New York 17, N. Y.

Vansul & Company
Englewood, New Jersey

Velsicol Corporation
330 East Grand Avenue
Chicago 11, Illinois

Viscatone Chemical Company
Zeigler, Ill.

Vulcan Containers Inc.
Bellwood, Illinois

Vulcan Steel Container Company
Birmingham, Ala.

W

Warwick Wax Co., Inc.
10-10 44th Avenue
Long Island City 1, N. Y.

T. F. Washburn Company
2244 Elston Avenue
Chicago 14, Illinois

Watchemoket Optical Co., Inc.
232 W. Exchange Street
Providence 3, R. I.

Westvaco Chemical Division
Food Machinery and Chemical Corporation
161 East 42nd Street
New York 17, N. Y.

West Virginia Pulp and Paper Company
Charleston A, South Carolina

Western Machinery Company
760-766 Folsom Street
San Francisco 7, Calif.

Westvaco Chemical Division
Food Machinery & Chemical Corp.
161 E. 42nd Street
New York 17, N. Y.

Whiting Corporation
Harvey, Illinois

F. H. Wiessner, Inc.
Burlington, Vermont

Wilder Mfg. Co., Inc.
Mechanic St. & Erie RR
Port Jervis, N. Y.

A. R. Wilfley & Sons, Inc.
P.O. Box 2330
Denver, Colo.

C. K. Williams & Co.
640 N. 13th Street
Easton, Pennsylvania

Willson Products, Inc.
Reading, Pa.

W. S. Wilson Corp.
11 S. William Street
New York 4, N. Y.

Wilson & Company
Wilson-Martin Division
Snyder Ave. & Swanson Street
Philadelphia 48, Pa.

Witco Chemical Company
122 E. 42nd Street
New York 17, N. Y.

Worklon, Inc.
253 W. 28th Street
New York 1, N. Y.

Worthington Corporation
Harrison, N. J.

Wyandotte Chemicals Corporation
Wyandotte, Michigan

Z

G. S. Ziegler & Company
99 Church Street
New York 7, N. Y.

Zinsser & Co. Inc.
Sub. of Harshaw Chemical Co.
Hastings-on-Hudson, N. Y.

William Zinsser & Company
516 W. 59th St.
New York 19, N. Y.

TRADE ASSOCIATIONS

NATIONAL PAINT, VARNISH and LACQUER ASSOCIATION
1500 Rhode Island Ave., N. W.
Washington 5, D. C.

FEDERATION of PAINT and VARNISH PRODUCTION CLUBS
121 South Broad St.
Philadelphia 7, Pa.

Air Pollution Control Association
4400 Fifth Avenue
Pittsburgh 13, Pa.

American Soybean Association
Hudson, Iowa

American Zinc Institute, Inc.
60 East 42nd Street
New York 17, N. Y.

The Asphalt Institute
801 Second Avenue
New York 17, N. Y.

Association of American Soap & Glycerine Producers, Inc.
295 Madison Avenue
New York 17, N. Y.

Copper & Brass Research Association
420 Lexington Avenue
New York 17, N. Y.

Environmental Equipment Institute
30 Church Street
New York 7, N. Y.

The Gummed Industries Association, Inc.
11 West 42nd Street
New York 36, N. Y.

Iodine Educational Bureau, Inc.
120 Broadway
New York, N. Y.

Institute of Industrial Health
University of Michigan
Ann Arbor, Michigan

Lead Industries Association
420 Lexington Avenue
New York 17, N. Y.

The Material Handling Institute, Inc.
813 Clark Building
Pittsburgh 22, Pa.

Metal Powder Association
420 Lexington Avenue
New York 17, N. Y.

National Barrel and Drum Assoc., Inc.
1145 19th St., N. W.
Washington 6, D. C.

The Naphthenate Preservatives Institute, Inc.
517 Wyatt Building
Washington 5, D. C.

Natural Rubber Bureau
1631 K Street, N.W.
Washington 6, D. C.

The National Tung Oil Marketing Cooperative Inc.
302 Magazine Street
New Orleans 12, La.

Paint Research Institute T.N.O.
Rijswijk (Z.H.), Netherlands

Shellac Information Bureau
65 Pine Street
New York 5, N. Y.

Steel Shipping Container Institute, Inc.
600 Fifth Avenue
New York 20, N. Y.

Steel Structures Painting Council
4400 Fifth Avenue
Pittsburgh 13, Pa.

The Tall Oil Association
122 East 42nd Street
New York 17, N. Y.

Tin Research Institute Inc.
492 West Sixth Avenue
Columbus 1, Ohio

Wet Ground Mica Association
420 Lexington Avenue
New York 17, N. Y.

TRADE NAME INDEX OF RAW MATERIALS AND EQUIPMENT

A

Abay—Mills & Mixing Machinery. **Paul O. Abbe Inc.**

Abbe—Mills & mixing machinery. **Paul O. Abbe Inc.**

Abbe—Mills & mixing machinery. **Abbe Engineering Company.**

Abitol—Technical hydroabietyl alcohol. **Hercules Powder Company**

AC—Polyethylene. **Semet-Solvay Petrochemical Division**

Acetate P.A.—Deodorant. **Givaudan-Delawanna, Inc.**

Acintene—Pinenes and turpentine. **Arizona Chemical Company**

Acintol—Tall Oil. **Arizona Chemical Company**

Acme—Shellac Varnish. **Acme Shellac Products Co.**

Aconew Extra—Refined tall oil fatty acids. **Newport Industries, Inc.**

Aconon—Refined tall oil. **Newport Industries, Inc.**

Acosix—Refined tall oil. **Newport Industries, Inc.**

Acrawax C—Synthetic wax. **Glyco Products Co., Inc.**

Acryloid—Acrylic ester resins. **Rohm & Haas Company**

Acrylon—Acrylic rubber. **The Borden Company**

Acrylonitrile—Monomers. **Carbide and Carbon Chemicals Company**

Acrysol—Acrylic resin. **Rohm & Haas Company**

Activ-8—Drier-stabilizer. **R. T. Vanderbilt Co.**

Adher-O-Flex—Esterified Shellac. **Acme Shellac Products Co.**

Adipol—Plasticizer. **Ohio-Apex Division**

Adlube—Plastic mold lubricant. **Advance Solvents & Chemical Corp.**

ADM Adols—Fatty Alcohols. **Archer Daniels Midland Company**

ADM Ester Gum—Complete line of Ester Gums. **Archer Daniels Midland Company**

ADM Natural Resins—Congo, Damar, East India, Kauri Gum, Manila Gum. **Archer Daniels Midland Company**

ADM Processed Congo—Fused & Esterified Congo Gum. **Archer Daniels Midland Company**

ADM Unadols—Fatty Alcohols. **Archer Daniels Midland Company**

Adol—Fatty Alcohols. **Archer Daniels Midland Company**

A D P—Carbon Black dispersions. **Acheson Dispersed Pigments Co.**

Advacide—Fungicidal compound. **Advance Solvents & Chemical Corp.**

Advagum—Synthetic rubber extender. **Advance Solvents & Chemical Corp.**

Advamin—Fungicidal compound. **Advance Solvents & Chemical Corp.**

Advamix—Wetting agent. **Advance Solvents & Chemical Corporation.**

Advan—Accelerators. **Advance Solvents & Chemical Corp.**

Advaresin—Drying oil extenders. **Advance Solvents & Chemical Corp.**

Advasol—Driers. **Advance Solvents & Chemical Corp.**

Advastab—Vinyl resin stabilizers. **Advance Solvents & Chemical Corp.**

Advawax—Petroleum waxes. **Advance Solvents & Chemical Corp.**

Adawet—Wetting agents. **Advance Solvents & Chemical Corp.**

Aero—Maleic and Phthalic Anhydrides; various grades of Aluminum, Zinc, and Calcium Metallic Soaps. **American Cyanamid Company**

Aerosol—Surface Active Agents. **American Cyanamid Company**

Air-Matic—Small parts washer. **The Protecto-seal Co.**

Alamac—Fatty amine esters. **General Mills, Inc.**

Alamask—Paint deodorant. **Rhodia, Inc.**

Alamine—Primary fatty amines. **General Mills, Inc.**

Alathon—Polyethylene resin. **E. I. du Pont de Nemours & Co.**

Albacar—Precipitated calcium carbonate. **C. K. Williams & Co.**

Albalith—Lithopone. **New Jersey Zinc Co.**

Albone—Hydrogen peroxide. **E. I. du Pont de Nemours & Co.**

Albron—Aluminum Powders and Pastes. **Aluminum Company of America**

Alcoa—Aluminum Powders and Pastes. **Aluminum Company of America**

Algel—Gelling agent. **Raybo Chemical Co.**

Aliphat—Tall oil fatty acids. **General Mills, Inc.**

Alkaterges—Surface active agents. **Commercial Solvents Corporation**

Alkyum—Alkyd Resin. **Adco Chemical Co.**

Alodine—Protective coating chemicals for aluminum and aluminum alloys. **American Chemical Paint Company**

Alrosols—Surface Active agent. **Geigy Industrial Chemicals**

Alsibronz—Water ground mica. **Franklin Mineral Products Company**

Amberlac—Modified alkyds. **Rohm & Haas Co.**

Amberol—Varnish and lacquer resins. **Rohm & Haas Company**

Amine O—Surface active agent. **Geigy Industrial Chemicals**

Amsco-Solv—A group of intermediate aromatic petroleum solvents in varying boiling ranges. **American Mineral Spirits Company**

Analyte—Color comparator. **Crown Engineering & Sales Company**

Antifoam A—Silicone defoamer. **Dow Corning Corp.**

Antioxidant B—Antiskinning agent and antioxidant. **National Aniline Division**

Antioxidant D—Antiskinning agent and antioxidant. **National Aniline Division**

AntiSag—Anti-sagging, anti-settling, wetting and dispersing agent. **Raybo Chemical Company**

AntiSilk—Anti-silking, anti-floating agent. **Raybo Chemical Company**

Antiskin—Anti-skinning agent. **Raybo Chemical Company**

Antistat—Anti-static agent. **Raybo Chemical Company**

Apco—Aliphatic hydrocarbon thinner. **Anderson-Prichard Oil Corporation**

Apcothinner—Aliphatic petroleum thinner. **Anderson-Prichard Oil Corporation**

Aquasperse 30—Casein vehicle for emulsion paints. **American Resinous Chemicals Corp.**

AR—Polyester resins. **General Electric**

Araldite—Epoxy resins. **Ciba Company Inc.**

A-Resin—Heat convertible unsaturated aliphatic pure hydrocarbon polymer. **Enjay Company, Inc.**

Aritemp—Epoxy Casting Resins. **Aries Laboratories, Inc.**

Arlcite—Grinding balls. **Patterson Foundry & Machine Co.**

Armac—Acetic acid salts of fatty amines. **Armour Chemical Division**

Armeens—High molecular weight aliphatic amines. **Armour Chemical Division**

Arochem—Modified Phenolic Resins, modified maleic resins, specialty resins. **Archer Daniels Midland Company**

Aroclor—Chlorinated biphenyl resins. **Monsanto Chemical Company**

Arofene—Pure Phenolic Resins. **Archer Daniels Midland Company**

Aroflat—Alkyds & Specialties for Flat Finishes. **Archer Daniels Midland Company**

Aroflo—Channel black. **J. M. Huber Corp.**

Aroostocrat—Potato Starch. **Morningstar, Nicol, Inc.**

Aroplaz—Alkyd and Allied Resins. **Archer Daniels Midland Company**

Aropol—Copolymer Modified Alkyds, Polyester Resins. **Archer Daniels Midland Company**

Arrow Ink Black—Channel Black. **J. M. Huber Corp.**

ASA—Antiskinning agent and antioxidant. **National Aniline Division**

Asbestol—Calcium carbonate extender pigments. **Carbola Chemical Company**

ASP—Extender pigments, aluminum silicate. **Minerals & Chemicals Corp. of America**

Atlac—Polyester Alkyd Resins. **Atlas Powder Company**

Atlas—Dry colors. **H. Kohnstamm & Co., Inc.**

Attaclay—Finely powdered fullers earth. **Minerals & Chemicals Corp. of America**

Attasol—Colloidal fullers earth. **Minerals & Chemicals Corp. of America**

Attasorb—Fullers Earth. **Minerals & Chemicals Corp. of America**

Aulabrite—Water dilutable color emulsions. **Aula Chemicals, Inc.**

Auto-Klean—All metal edge type filter. **The Cuno Engineering Corp.**

Azo—Zinc oxide pigments; lead-free and leaded. **American Zinc Sales Company**

B

Barden—Kaolin. **J. M. Huber Corp.**

BCU—Urea resins. **Bakelite Company.**

Bear—Lampblack. **Monsanto Chemical Co.**

Beckacite—Modified Phenolic resins. **Reichhold Chemicals, Inc.**

Beckamine—Urea-formaldehyde resins. **Reichhold Chemicals, Inc.**

Beckobol—Modified phenolic resins. **Reichhold Chemicals, Inc.**

Beckolin—Synthetic drying oils. **Reichhold Chemicals, Inc.**

Beckosol—Pure and modified alkyd resins. **Reichhold Chemicals, Inc.**

Beetle—Urea-Formaldehyde Resins. **American Cyanamid Company**

Benthal—Polyhydric alcohol. **Monsanto Chemical Company**

Bentone—Gelling Agents. **National Lead Co.**

Benzoflex—Chemical Plasticizers. **Tennessee Products & Chemical Corporation**

Big-M-Gel—Long oil liquid gel. **Adco Chemical Company**

BKS—Polystyrene emulsion. **The Bakelite Co.**

Black Pearls—Carbon Black pigments. **Godfrey L. Cabot, Inc.**

Black Shield—Pigment dispersions. **Carbon Dispersions, Inc.**

Blancol—Anionic dispersant. **Antara Chemicals**

B. M. G.—Long oil liquid gel. **Adco Chemical Company**

Borotherm—Highly soluble borate composition for fire resistant water-base paints. **American Potash & Chemical Corp.**

Boxeal—Case sealing glue. **Paisley Products, Inc.**

BRC—Resinous hydrocarbon plasticizer. **Barrett Division**

BR Castor Oil—Bleached, refined, raw castor oil. **Pacific Vegetable Oil Corp.**

Brij—Emulsifiers; polyoxyethylene lauryl ethers. **Atlas Powder Company**

Bronoco—Aliphatic and aromatic petroleum solvents. **The R. J. Brown Company**

BRS—Polyester resins. **Bakelite Company**

Buckeye Pro-Cote—Protein thickener-stabilizer. **The Buckeye Cotton Oil Company**

Buckeye Protein—Protein thickener-stabilizer. **The Buckeye Cotton Oil Company**

Bufen 30—Preservative. **Buckman Laboratories, Inc.**

Bufenoleate 30—Preservative. **Buckman Laboratories, Inc.**

Burnok—Thixotropic paint vehicles. **Fred'k. A. Stresen-Reuter, Inc.**

Burnok—Thixotropic vehicles. **T. F. Washburn Company**

Burtonite—Guar Seed Gum. **The Burtonite Co.**

Burundum—Grinding media. **The U. S. Stoneware Company**

Butaprene—Paint latex. **The Firestone Plastics Company**

Butarez—Petroleum hydrocarbon resin. **Phillips Petroleum Company**

Butrol—Preservative. **Buckman Laboratories, Inc.**

Butvar—Polyvinyl butyral resin. **Monsanto Chemical Company**

C

Cabflex—Chemical plasticizers. **Godfrey L. Cabot, Inc.**
Cab-o-sil—Silica pigment used in paints and varnishes. **Godfrey L. Cabot, Inc.**
Cabotite—Nonmetallic mineral extender pigment. **Godfrey L. Cabot, Inc.**
Cadmolith—Cadmium red and yellow lithipones. **The Glidden Company**
Calcicoater Oil—Bodied Vegetable oil. **Pacific Vegetable Oil Corp.**
Calinate—Calcium soaps. **The Harshaw Chemical Company**
Caltrol—Viscosity controller. **Brown-Allen Chemicals, Inc.**
Carbitol—Solvent. **Carbide and Carbon Chemicals Company**
Carbo Blue—Iron blue dispersions. **Kentucky Color & Chemical Company**
Carbolac—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Carbopol—Water sensitive gum, paint thickener **B. F. Goodrich Chemical Company**
Carbose—Sodium Carboxymethylcellulose.. **Wyandotte Chemicals Corp.**
Cargillon Polyester resins. **Cargill, Inc.**
Cargoils Fish oil based oils for barn paints. **Cargill, Inc.**
Casco—Urea-formaldehyde Resins. **The Borden Company**
Castorwax—Waxlike, hydrogenated castor oil. **The Baker Castor Oil Company**
C-D-M—Centrifugally Cast Dual Metal Rolls. **J. M. Lehmann Co., Inc.**
Celite—Extender pigment, diatomaceous silica. **Johns-Manville Products Corp.**
Cellolyn—Abitol-derived alkyds and modified pentaerythritol esters of rosin. **Hercules Powder Company**
Cellosize—Hydroxyethyl Cellulose. **Carbide and Carbon Chemicals Division**
Cellosolve—Solvent. **Carbide and Carbon Chemicals Company**
Century Blue—Indanthrene blues. **Kentucky Color & Chemical Company**
Charlotte—Colloid Mill. **Chemicolloid Laboratories Inc.**
Chembine—Ester of polyalcohol. **Naftone, Inc.**
Chemstor—Glass lined storage tanks. **The Pfaudler Company**
Cherokee—Kaolin Clay. **R. T. Vanderbilt Co.**
Chlorowax 40—Plasticizer; liquid chlorinated paraffin. **Diamond Alkali Company**
Chlorowax 70—Resinous chlorinated paraffin. **Diamond Alkali Company**
Citation Red—Permanent red 2-B, BON type. **Kentucky Color & Chemical Company**
Citro Reodorant—Paint deodorant. **Florida Molasses Corporation**
Citroflex—Citric acid ester plasticizers. **Chas. Pfizer & Co., Inc.**
Clearate—Lecithin. **W. A. Cleary Corp.**
CMC—Sodium carboxymethylcellulose. **Hercules Powder Company**
C-Oil—Hydrocarbon drying oil. **Enjay Company, Inc.**
Cold-Pro—Bleached Shellac. **Acme Shellac Products Company**
Common Sense—Disc filter. **Filpaco Industries**
Concord Maroon—Deep BON Maroon. **Standard Ultramarine & Color Company**
Continental—Carbon Blacks. **Witco Chemical Company**
Continental—Kaolin Clay. **R. T. Vanderbilt Company**
Continex—Furnace carbon black. **Witco Chemical Company**
Coors—High density grinding media. **LZP Industrial Ceramics**
Cosol—High-flash naphtha. **Neville Chemical Company**
Covertex—Vehicles for emulsion paints and latex. **McCloskey Varnish Company**
Cowles—Mixers. **Morehouse-Cowles Inc.**
Crypton ZS—Zinc Sulfide. **New Jersey Zinc Co.**
CTLA—Heat-reactive, aromatic-type olefinic hydrocarbon polymer. **Enjay Company Inc.**
Cumar—Paracoumarone-indene resins. **Barrett Division**
Cunilate—Fungicides. **Scientific Oil Compounding Company, Inc.**
Cunimene—Fungicides. **Scientific Oil Compounding Company, Inc.**
Cyanegg—Sodium cyanide. **E. I. du Pont de Nemours & Company, Inc.**
Cyclodex—An emulsifiable cobalt catalyst. **Nuodex Products Company, Inc.**
Cyclowhirl—Portable mixer. **The Kwerel Co.**
Cycolac—Styrene copolymer resin. **Marbon Chemical Division**
Cycopol—Copolymer Resins. **American Cyanamid Company**
Cykel—Dicyclopentadiene treated vegetable oil. **Spencer Kellogg & Sons Inc.**
Cykelin—Dicyclopentadiene treated linseed oil. **Spencer Kellogg & Sons Inc.**
Cykelsoy—Dicyclopentadiene treated soybean oil. **Spencer Kellogg & Sons Inc.**
C-8—Epoxy resins. **Bakelite Company**

D

Dag—Colloidal graphite dispersions. **Acheson Colloids Company**
Dapon—Diallyl phthalate prepolymer. **Ohio-Apex Division**
Darex Copolymer—Styrene-Butadiene Copolymer. **Dewey & Almy Chemical Co.**
Darex D10P—Chemical Plasticizers. **Dewey & Almy Chemical Company**
Darex Everflex—Polyvinyl Acetate emulsion. **Dewey & Almy Chemical Company**
Darsol—Metal cleaner. **Dacar Chemical Products Company**
Darvan—Dispersing Agents. **R. T. Vanderbilt Company**
Davenite—Water ground mica. **Hayden Mica Company**
Drapex—Epoxy stearate plasticizer. **Argus Chemical Corp.**
Defoamer ED—Anti-Foam Agent. **El Dorado Oil Works**
Dehydol—Nonionic surface active agent. **Fallek Products Company, Inc.**
DEO Oil—Deodorized fish oil. **Pacific Vegetable Oil Corp.**
Deodorized Apco—Deodorized aliphatic hydrocarbon thinner. **Anderson-Prichard Oil Corp.**
Deoxidine—Metal cleaners and rust removers. **American Chemical Paint Company**
Detrex 79—Cleaner & phosphate treatment for steel. **Detrex Corporation**
D.G.—Magnesium Silicate. **Tamms Industries, Inc.**
Diamond K—Oxidized oils. **Spencer Kellogg & Sons Inc.**
Dicalite—Diatomaceous Silica extender pigment. **Great Lakes Carbon Corporation**
Dicom—Dipentene. **Newport Industries, Inc.**
Dinopol—Plasticizer. **Ohio-Apex Division**
Dipentek—Dipentaerythritol technical. **Heyden Chemical Corporation**
Dipentene No. 122—Solvent—51% dipentene with other terpene hydrocarbons. **Hercules Powder Company**
Disperse—Aqueous phase dispersant. **Raybo Chemical Company**
Disperso—Wettable Metallic stearates. **Witco Chemical Company**
Dixie Perfecto—Carbon Black. **United Carbon Company, Inc.**
Dixie Reds—Toluidine and Para Substitutes. **Standard Ultramarine & Color Company**
DMT—Dinethyl terephthalate. **Hercules Powder Company**
Doubl—Limed wood rosin. **Newport Industries, Inc.**
Dow Latex—Emulsion of either vinyl chloride, vinylidene chloride copolymer, styrene-butadiene copolymer, or polyvinylidene chloride. **The Dow Chemical Company**
Dowicides—Industrial germicide & fungicides. **Dow Chemical Company**
Dresinate—Surface active sodium and potassium salts of rosins and tall oil. **Hercules Powder Company**
Dri-Film—Silicone water-repellents. **General Electric**
Drisoy—Treated soybean oil. **Spencer Kellogg & Sons Inc.**
Duol—Resinated Lithol Rubine pigment. **E. I. du Pont de Nemours & Company**
Duplicane #517—Sugar cane wax. **Warwick Wax Company, Inc.**
Duraplex—Phthalic alkyd resins. **Rohm & Haas Company**
Duratone Reds—Toluidine and Para Substitutes. **Standard Ultramarine & Color Company**
Durez—Phenol-formaldehyde resins. **Durez Plastics & Chemicals, Inc.**
Duroxon—Soft Waxes. **Dura Commodities Corporation**
Dutch Boy—Pigments—antimony oxide, calcium carbonate, barytes, white lead, red lead, litharge, Linseed oils, Chemical Plasticizers. **National Lead Company**
Dryolene—Aliphatic petroleum thinner (VM&P). **Anderson-Prichard Oil Corporation**
Dylan—Polyethylene. **Koppers Company, Inc.**
Dymerex—Dimerized wood rosin. **Hercules Powder Company**
Dyphos—Stabilizers for vinyls. **National Lead Company**

E

Eagle-Picher—Lead and Zinc Pigments. **The Eagle-Picher Company**
Easy Ride—Conveyors. **Filpaco Industries**
EGD—Acrylic Monomer. **American Monomer Corporation**
EHEC—Ethylated hydroxethyl cellulose. **Hercules Powder Company**
Elastex 40-P—Butyl iso decyl phthalate plasticizer. **Barrett Division**
Eldo—Fatty acids. **El Dorado Oil Works**
Elf—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Elftex—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Elvacet—Polyvinyl acetate emulsion. **E. I. du Pont de Nemours & Company**
Elvadex—Vinyl acetate copolymer. **E. I. du Pont de Nemours & Company**
Elvanol—Polyvinyl alcohol resin. **E. I. du Pont de Nemours & Company**
Emcol H-50A—Hydrocarbon Solvent Emulsifier. **The Emulsol Corporation**
Emerox—Dibasic acids. **Emery Industries, Inc.**
Emersol—Fatty acids made by selective solvent separation. **Emery Industries, Inc.**
Emfac—Monobasic acids. **Emery Industries, Inc.**
Empol—Polymerized fatty acids. **Emery Industries, Inc.**
Emulphor—Nonionic surfactant. **Antara Chemicals**
Epi-rez—Pure epichlorohydrin bisphenol resins. **Jones-Dabney Company**
Epi-Tex—Oil modified epichlorohydrin bisphenol resins. **Jones-Dabney Company**
Epi-Var—Oil modified epichlorohydrin bisphenol resins. **Jones-Dabney Company**
Epocast—Epoxy resins. **Furane Plastics, Inc.**
Epolene—Polyethylene waxes. **Eastman Chemical Prods., Inc.**
Epon—Epoxy resins. **Shell Chemical Corp.**
ERCO Brown—Concentrated brown iron oxides. **Reichard-Coulston, Inc.**
Espesol—Aromatic petroleum solvents. **Eastern States Chemical Corp.**
Esskol—Refined linseed oil. **Spencer Kellogg & Sons Inc.**
Esso—Aliphatic petroleum solvents. **Esso Standard Oil Company**
Ester Gum 8D and 8L—Glycerol esters of pale wood rosin. **Hercules Powder Company**
Ethocel—Ethyl Cellulose resins. **The Dow Chemical Company**
Ethofats—Surface active agents. **Armour Chemical Division**
Ethomeens—Surface active agents. **Armour Chemical Division**
Ethomids—Surface active agents. **Armour Chemical Division**
EVT-50—Styrene butadiene latex. **Cargill, Inc.**
EXBC—Polyvinyl Ethyl ether polymer. **Bakelite Company**
EXBM—Polyvinyl ethyl ether polymer. **Bakelite Company**
Excelsior—Carbon Black pigment. **Columbian Carbon Company**
Exkins—Volatile anti-oxidant. **Nuodex Products Company, Inc.**
Exon—Vinyl & Styrene Resins. **Firestone Plastics Company**

F

FA—Alkyds. **Farnow, Inc.**
FA—Furfuryl alcohol. **The Quaker Oats Co.**
Fade-Ometer—Sunfastness Testing Machine. **Atlas Electric Devices Company**
FAFL—Flat Alkyd Vehicle. **Farnow, Inc.**
Falk Soybean Oils—Soybean oils, (raw, bodied, blown, kettled and specialty). **Cargill, Inc.**
Falkidine—Hard drying fish oils. **Cargill, Inc.**
Falkolin—Linseed oils, (raw, bodied, blown, kettled and specialty). **Cargill, Inc.**
Falkomast—Fish and soybean oils specially processed for caulking compounds. **Cargill, Inc.**
Falkore—Esterified tall oils. **Cargill, Inc.**
Falkosoy—Maleinized soybean oils. **Cargill, Inc.**
Falkote—Maleic ester gums. **Cargill, Inc.**
Falkovar—Fish oils, (raw, bodied, blown, kettled and specialty). **Cargill, Inc.**
Falkowood—Maleinized linseed oils and fish oils. **Cargill, Inc.**
Falkyd—Oil modified alkyd resins. **Cargill, Inc.**
Fatchemco-O—Emulsifier. **Universal Chemicals Corporation**
FCD—Alkyd, phenolic, natural resins. **France, Campbell & Darling, Inc.**
Fine—Organic dry colors. **Fine Colors Company**
Flexbond 800—Polyvinyl acetate emulsion. **The Colton Chemical Company**
Flexol—Plasticizers. **Carbide and Carbon Chemicals Company**
Flexowax C—Synthetic wax; anti-mar agent for lacquers. **Glyco Products Company, Inc.**
Floinducer—Levelling agent. **Raybo Chemical Company**
Florence—French Process Zinc Oxide. **New Jersey Zinc Company**
Flow-Master—Homogenizer. **Marco Company, Inc.**
Fluorothene—Polymonochlorotrifluoroethylene polymer. **Bakelite Company**
Foamex—Liquid defoaming agent. **Glyco Products Company, Inc.**
Fo-Glo—Rosin gloss oil. **Newport Industries, Inc.**
F-O-M—Float-O-Matic control of rolls. **J. M. Lehmann Company, Inc.**
Formvar—Polyvinyl formal resin. **Monsanto Chemical Company**
Fosbond—Phosphate coating and rust-proofing compound. **Pennsylvania Salt Manufacturing Company**
Fosfo—Limed wood rosin. **Newport Industries, Inc.**
Foster—Rotary Pumps. **Foster Pump Works, Inc.**
Fotocol—Proprietary Solvent. **Commercial Solvents Corporation**
FR-28—Sodium Borate, fire retardant. **Pacific Coast Borax Company**
Franklin—Pulverizers. **Franklin P. Miller & Son, Inc.**

G

Gafite—Polymethyl alphachloroacrylate. **General Aniline & Film Corp.**
Gelva—Polyvinyl acetate resins. **Shawinigan Products Corporation**
Gelva Emulsion—Polyvinyl acetate emulsions. **Shawinigan Products Corporation**
Gen-Flo—Styrene butadiene emulsion. **The General Tire & Rubber Company**

Gensol #2, #6—Terpene solvent. **Newport Industries, Inc.**
Geon Latex—Polyvinyl chloride emulsions. **B. F. Goodrich Chemical Company**
Geon Resin—Polyvinyl chloride resins. **B. F. Goodrich Chemical Company**
GGP Aluminum Extra Brilliant—Flake Aluminum Powder. **U. S. Bronze Powder Works, Inc.**
Glaurin—Grinding aid and dispersing agent. **Glyco Products Company, Inc.**
Glyptal—Alkyd resins. **General Electric**
G.N.S. #5—Pine Oil. **Newport Industries, Inc.**
Gold Bond "R" Silica—Amorphous Silica. **Tamms Industries, Inc.**
Grandodraw—Zinc-phosphate coating chemicals for cold-forming. **American Chemical Paint Company**
Granodine—Zinc-phosphate coating chemicals for bonding paint to steel. **American Chemical Paint Company**
Green-Gold—Lightfast yellow pigment. **E. I. du Pont de Nemours & Co., Inc.**
Grellow—Special lead chromate for green. **Kentucky Color & Chemical Company**
Grip-Tight—Labeling Paste. **Paisley Products, Inc.**
Groco—Fatty acids. **A. Gross & Company**
Gulf—Aliphatic petroleum solvents. **Gulf Oil Corporation**
Guyandot Red Toners—Toluidine Substitutes. **Standard Ultramarine & Color Company**

H

Half-second Butyrate—Cellulose acetate butyrate resin. **Eastman Chemical Products, Inc.**
Halowax—Chlorinated naphthalene waxes. **Bakelite Company**
Harflex—Plasticizers. **Harchem Division**
Harshaw-V—Vinyl Stabilizers. **The Harshaw Chemical Company**
HB-20,40—Alkyl-aryl type plasticizers. **Monsanto Chemical Company**
Hellogen—Phthalocyanine blue and green pigments. **General Dyestuff Corp.**
Helix—Limed wood rosin. **Newport Industries, Inc.**
Hercoflex—Chemical plasticizers. **Hercules Powder Company**
Hercolyn—Hydrogenated methyl ester of rosin. **Hercules Powder Company**
Hetron—Polyester resins. **Hooker Electrochemical Company**
Hexogen—Paint driers. **Advance Solvents & Chemical Corporation**
Hilos—Limed wood rosin. **Newport Industries, Inc.**
HiSolv Solvents—Petroleum Aromatic solvents. **Pennsylvania Industrial Chemical Corp.**
HiWhite—Airfloated Georgia kaolinite. **J. M. Huber Corp.**
Horse Head—Zinc pigments. **New Jersey Zinc Company**
HR Cobalt 254—A cobalt "feeder" drier. **Nuodex Products Company, Inc.**
HTS—Basic Carbonate White Lead. **National Lead Company**
Hydrasperse—Aluminum silicate extender pigment. **J. M. Huber Corp.**
Hydratex—Aluminum silicate extender pigment. **J. M. Huber Corp.**
Hydrofol—Glycerides & fatty acids. **Archer-Daniels-Midland Company**
Hyfac—Hydrogenated fatty acid. **Emery Industries, Inc.**
Hypalon—Methacrylic ester polymers and chlorosulfonated polyethylene elastomer. **E. I. du Pont de Nemours & Company**
Hyros—Heat-treated wood Rosin. **Newport Industries, Inc.**
Hy-Speed—Agitators & Mixers. **Alsop Engineering Corporation**

I

Iceberg—Aluminum Silicate Pigments. **Burgess Pigment Company**
Igepal—Emulsifiers. **Antara Chemicals**
Igepon—Wetting & dispersing agents. **Antara Chemicals**
Impervite—Centrifugal pumps. **Falls Industries, Inc.**
Indopol—Liquid polybutenes. **Indoil Chemical Company**
Indulin-70-GR-S—Coprecipitate of lignin and a butadiene-styrene copolymer. **West Virginia Pulp and Paper Company**
Indusoil—Distilled tall oil. **West Virginia Pulp & Paper Company**
International—Mixers. **International Engineering, Inc.**
Iridite—Chromate conversion coatings. **Allied Research Products, Inc.**
Iron Red—Calcined synthetic yellow oxide. **Reichard-Coulston, Inc.**
Iron Yellow—Precipitated pure yellow oxide. **Reichard-Coulston, Inc.**
Irrathene—Irradiated polyethylene. **General Electric**
Isco Amorphous Silica—Extender pigment. Silica. **Innis, Speiden & Company, Inc.**
Isofoam—Polyisocyanate foaming resin. **Isocyanate Products, Inc.**

J

Jaysol—Isopropyl alcohol. **Enjay Company, Inc.**
Jet—Mixers. **Hermas Machinery Co., Inc.**
Jet Mill—High speed dispersion mill for liquids. **Patterson Foundry & Machine Company**

K

Kadox—Finest particle size Zinc Oxides. **New Jersey Zinc Co.**
Kady Mills—Dispersion Milling equipment. **Kinetic Dispersion Corporation**
Kaymol—Surface active agent, emulsifier, antifoaming agent. **Kraft Chemical Company**
Kapsol—Plasticizer. **Ohio-Apex Division**
KCC—Talc type extender. **Kraft Chemical Co.**
Kel-F—Trifluorochloroethylene polymer. **The M. W. Kellogg Company**
Kellin—Refined linseed oil. **Spencer Kellogg & Sons Inc.**
Kel-sol—Universal tinting vehicle. **Spencer Kellogg & Sons Inc.**
Keltrol—Styrenated linseed and soybean oils. **Spencer Kellogg & Sons Inc.**
Kel-Vi-Tol—Linseed varnish oil. **Spencer Kellogg & Sons Inc.**
Kel-X-L—Treated linseed oil. **Spencer Kellogg & Sons Inc.**
Kenflex A—Polymer of aromatic hydrocarbons. **Kenrich Corp.**
Kenite—Extender pigment; diatomaceous earth. **Innis, Speiden & Co., Inc.**
Kneadermaster—Dispersion type mixer. **Patterson Foundry & Machine Company**
Kopol—Congo copal resins. **Reichhold Chemicals, Inc.**
Koresin—Condensation product of p-tertiary butyl phenol with acetylene. **General Dyestuff Corp.**
Korp—Soda-treated wood rosin. **Newport Industries, Inc.**
Kosmolak—Carbon black. **United Carbon Co., Inc.**
Kosmos F-4, BB, 1—Carbon black. **United Carbon Co., Inc.**
KPO—Polymerized linseed oils. **Spencer Kellogg & Sons Inc.**
Kralastic—Styrene-butadiene resins. **Naugatuck Chemical**
Kreelon—Emulsifying wetting and penetrating agent (Anionic). **Wyandotte Chemicals Corp.**
Kroma Reds—Pure precipitated red iron oxides. **C. K. Williams & Co.**
Kronisol—Chemical plasticizers. **Ohio-Apex Div.**
Kronitex—Chemical plasticizers. **Ohio-Apex Div.**
Krumbhaar—Phenolic resins. **Krumbhaar Chemicals Inc.**
KTPL—Low molecular weight polystyrene resins. **Koppers Company, Inc.**
K.V.O.—Linseed varnish oils. **Spencer Kellogg & Sons Inc.**
Lactol Spirits—An aliphatic naphtha in the toluol evaporation range. **American Mineral Spirits Company**

L

Laminac—Unsaturated polyester resins. **American Cyanamid Company**
Landora—Soda-treated wood rosin. **Newport Industries, Inc.**
Lauxein—Casein and soybean adhesives. **Monsanto Chemical Co.**
Lauxite—Urea, phenolic, melamine, and resorcinol resins. **Monsanto Chemical Company**
"L" China Clay—China clay. **Tamms Industries, Inc.**
L. C. Lin—Low cost bodied linseed oil. **Brown-Allen Chemicals, Inc.**
Lehigh—Leaded zinc oxide. **New Jersey Zinc Company**
Lemac—Polyvinyl acetate. **The Borden Co.**
Lemol—Polyvinyl alcohol. **The Borden Co.**
Lewisol—Maleic alkyd-modified rosin esters. **Hercules Powder Company**
Lightnin—Mixers. **Mixing Equipment Co., Inc.**
Lignocol—Anti-skinning agent and anti-oxidant. **Heyden Chemical Corporation**
Ligro—Crude tall oil. **West Virginia Pulp & Paper Company**
Linoresinate—Tall oil type driers. **The Harshaw Chemical Company**
Lithoform—Zinc-phosphate coating chemicals for bonding paint to zinc. **American Chemical Paint Company**
Lo-Odor—Octasol driers. **The Harshaw Chemical Company**
Lorite—Diatomaceous material. **National Lead Company**
Lorol—Fatty alcohols. **E. I. du Pont de Nemours & Company**
LP-2—Polysulfide hydrocarbon resins. **Thiokol Corporation**
Lucite—Methyl methacrylate resin. **E. I. du Pont de Nemours & Company**
Lumigraphic colors—Special organic colors fluorescing in daylight or under ultraviolet light. **Imperial Paper and Color Corporation.**
Luncor PVC—Polyvinyl chloride valves. **Lunkenheimer Company**
Lustrex—Polystyrene resins. **Monsanto Chemical Company**
Lustrex Latex—Polystyrene emulsion. **Monsanto Chemical Company**

M

Magnaflake—Metal Powders and Pastes. **Magna Manufacturing Company, Inc.**
Makanol—Unsaturated fatty alcohols. **The Stepan Chemical Company**
Malix 138—Limed wood rosin. **Newport Industries, Inc.**
Mammopol—Modified fish oil. **Pacific Vegetable Oil Corp.**
Mapico—Iron oxide pigments. **Columbian Carbon Company**
Marbon 9200—Styrene copolymer resin & pigment chips. **Marbon Chemical Division**
Marco—Unsaturated polyester resins. **Celanese Corporation of America**
Marcothix—Unsaturated polyester resin. **Celanese Corporation of America**
MarHard—Mar proofing agent. **Raybo Chemical Company**
Marlex—Polyethylene. **Phillips Petroleum Co.**
Marlin Maroon—Yellowish BON maroon. **Standard Ultramarine & Color Company**
Maroc 6—Limed wood rosin. **Newport Industries, Inc.**
Maroon-gold—Transparent durable maroon pigment. **E. I. du Pont de Nemours & Co., Inc.**
Marvinol—Polyvinyl chloride resin. **Naugatuck Chemical**
Maskit #2—Paint deodorant. **Aromatic Products, Incorporated**
M C—Catalyst for unsaturated polyester resins. **Celanese Corporation of America**
M D—Aluminum powders & pastes. **Metals Disintegrating Company Inc.**
M.D.A.—Methylene disalicylic acid. **Heyden Chemical Corporation**
Meadol—Lignin. **The Mead Corporation**
Melmac—Melamine-Formaldehyde resins. **American Cyanamid Company**
Mersolite—Fungicides phenyl mercury salts. **Innis, Speiden & Co., Inc.**
Mert ZT—Fungicide. **Carolina Aniline & Extract Company**
Metalead—Metallic lead flakes. **Metalead Products Corporation**
Metasap—Suspending agent. **Nopco Chemical Company**
Methac—Methyl acetate-methanol. **The Borden Company**
Methocel—Methyl cellulose. **The Dow Chemical Company**
Methyl acetone—Methyl acetate-methanol-acetone. **The Borden Company**
Methylac—Methyl acetate solvent. **The Colton Chemical Company**
Methylon—Chemical-resistant coating intermediates. **General Electric**
Metrolin—Enamel and paint vehicle. **Brown-Allen Chemicals, Inc.**
Metso 99—Surface active agents. **Philadelphia Quartz Company**
Micro-Klean—Micronic disposable filter cartridge. **The Cuno Engineering Corp.**
Micro-Mica—Finely ground micronized mica. **The English Mica Company**
Micro Velva—Calcium carbonate extender pigment. **Carbola Chemical Company**
Mikro—Milling machinery. **Pulverizing Machinery Company**
Mill—Limed wood rosin. **Newport Industries, Inc.**
Miller—Crushers. **Franklin P. Miller & Sons, Inc.**
Milmer—Fungicides. **Monsanto Chemical Co.**
Ming Orange—Molybdate orange. **Kentucky Color & Chemical Company**
Mintrol Spirits—A new mineral spirits with a very mild odor. **American Mineral Spirits Co.**
Mirasol—Alkyd resins. **C. J. Osborn Company**
Mixall Mixers—Claw mixing propellers. **Craddock Equipment Company, Inc.**
Mix Mor—Mixers. **Hy-R-Speed, Inc.**
Mod col VD—Synthetic thickener for latex paints. **Nopco Chemical Company**
Mogul—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Molacco—Carbon black pigment. **Columbian Carbon Company**
Molora Maroon—Light BON maroon. **Standard Ultramarine & Color Company**
Monamine—Surface active agents. **Mona Industries, Inc.**
Monarch—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Monarchrome Greens—Pigments; co-precipitated phthalocyanine blue and chrome yellow. **Imperial Paper and Color Corporation**
Monastral—Copper phthalocyanine blue and green. **E. I. du Pont de Nemours & Company**
Monopentek—Monopentaerythritol. **Heyden Chemical Corporation**
Monoplex—Monomeric ester plasticizers. **Rohm & Haas Company**
Monosulph—Emulsifier for water-based paints. **Nopco Chemical Company**
Morehouse—Grinding mills. **Morehouse-Cowles Inc.**
Morningstar—Starches and Dextrines. **Morningstar, Nicol, Inc.**
MPL Monomer—Autopolymerizable acrylic monomer. **The Borden Company**
M R—Unsaturated polyester resins. **Celanese Corporation of America**
MS2—Alicyclic ketone resin. **Howards & Sons LTD.**
Multicel—Diatomaceous earth. **Tamms Industries, Inc.**
Multifex—Calcium carbonate extender pigments. **Diamond Alkali Company**
Multi-wash—Fume control. **Claude B. Schneible Company**

Munn—Soda-treated wood rosin. **Newport Industries, Inc.**
Myverol—High-potency distilled monoesters. **Distillation Products Industries**

N

Naccolene Concentrate—Detergent. **National Aniline Division**
Nacconate—Diisocyanates. **National Aniline Division**
Nacconols—Detergents. **National Aniline Div.**
Naccotan—Dispersing agent. **National Aniline Division**
Nadic—Dicarboxylic acid. **National Aniline Division**
Natural-Shape Media—High density grinding media. **LZP Industrial Ceramics**
Nebony—Thermoplastic hydrocarbon resins. **Neville Chemical Company**
Neo-fats—Fatty acids. **Armour Chemical Div.**
Neolyn—Rosin derived alkyd resin. **Hercules Powder Company**
Neo Spectra—Carbon black pigment. **Columbian Carbon Company**
Neosol—Ethyl alcohol proprietary solvent. **Shell Chemical Corporation**
Nestaco—Potato starch. **Morningstar, Nicol, Inc.**
Nettco—Agitating equipment. **New England Tank & Tower Company**
Nevillac—Phenol-modified coumarone and alkylated phenols. **Neville Chemical Company**
Nevindene—Coumarone-indene resins. **Neville Chemical Company**
Nevinol—Plasticizing and solvent oils. **Neville Chemical Company**
Nevsolv—Aromatic petroleum solvents. **Neville Chemical Company**
Newport Maroon—Transparent double maroon pigment. **E. I. du Pont de Nemours & Co., Inc.**
Newtrex—Special wood rosin. **Newport Industries, Inc.**
N-Glo-5&5Y—Rosin gloss oil. **Newport Industries, Inc.**
Nildew—Fungicides. **Naftone, Inc.**
Nilskin—Anti-skinning agent. **Naftone, Inc.**
Non-fer-Al—Calcium carbonate extender pigments. **Diamond Alkali Company**
Nonic—Surface active agents. **Sharples Chemicals Inc.**
Nonisols—Surface active agent. **Geigy Industrial Chemicals**
Nopco—Anti-foam agents, freeze-thaw stabilizers, wetting agents. **Nopco Chemical Company**
Nopco 1572-R—Polyvinyl acetate emulsion. **Nopco Chemical Company**
Nopcote—Polyamide resins. **Nopco Chemical Company**
Nora—Soda-treated wood rosin. **Newport Industries, Inc.**
Norlin—Catalytically polymerized linseed and soybean oils. **Cargill, Inc.**
Normasal—Stabilizers for vinyls. **National Lead Company**
Norvan—Polyvinyl acetate emulsions. **R. T. Vanderbilt Company**
NPA—Semi-alkyd vehicles. **Farnow, Inc.**
Nuact Paste—Lead "feeder" drier. **Nuodex Products Company, Inc.**
Nuade—Grinding aid. **Nuodex Products Co., Inc.**
Nuba—Coumarone-indene resins. **Neville Chemical Company**
Nulix-15—Limed polymerized wood rosin. **Newport Industries, Inc.**
Nullapon—Sequestering agents. **Antara Chemicals**
Nulskin—Discontinued name for anti-skinning agent. **Raybo Chemical Company**
Nuodex—Fungicides and driers. **Nuodex Products Company, Inc.**
Nuogel A.O.—Thickening agent. **Nuodex Products Company, Inc.**
Nuolates—Tallate driers. **Nuodex Products Company, Inc.**
Nuomix—Surface active agent. **Nuodex Products Company, Inc.**
Nuosperse 657—A combination of surface active agents. **Nuodex Products Company, Inc.**
Nuroz—Polymerized wood rosin. **Newport Industries, Inc.**
Nyco Super—Phthalocyanine blue and green pigments. **New York Color & Chemical Co.**
Nycolime—Phthalocyanine blue and green pigments. **New York Color & Chemical Co.**
Nytal—Talc. **R. T. Vanderbilt Company**

O

Octasol—Driers. **The Harshaw Chemical Co.**
Ohopex—Plasticizer. **Ohio-Apex Division**
OKO—Polymerized linseed oils. **Spencer Kellogg & Sons, Inc.**
ONB—Ortho-nitrobiphenyl plasticizer. **Monsanto Chemical Company**
OO Silica Smoke—Amorphous Silica. **Tamms Industries, Inc.**
Opalon—Vinyl chloride resin. **Monsanto Chemical Company**
Oronite—Polybutene. **Oronite Chemical Co.**
Orthophen—Amyl phenols for antiskinning. **Sharples Chemicals Inc.**
Orthotone Orange—Ortho-Nitraniline orange. **Standard Ultramarine & Color Company**

P

Paco Solvent TR 590—Proprietary alcohol solvent. **Publicker Industries, Inc.**
Paideos—Paint deodorants. **Dodge & Olcott, Inc.**
Paint Base Oil—Special pigmented base oil. **Pacific Vegetable Oil Corp.**
Paintodors—Paint deodorants. **Sindar Corporation**
Paisflex—Polyvinyl acetate resin paint base (internally plasticized). **Paisley Products, Inc.**
Paisley—General line of liquid labeling glues. **Paisley Products, Inc.**
Palconate—Surface active agent. **The Pacific Lumber Company**
Palcotan—Surface active agent. **The Pacific Lumber Company**
Panaflex BN—Hydrocarbon plasticizer. **Pan American Chemicals**
Panapol—Synthetic hydrocarbon drying oils. **Pan American Chemicals**
Panarez—Petroleum hydrocarbon resins. **Pan American Chemicals**
Panasol—High solvency aromatic solvents. **Pan American Chemicals**
Paradene—Coumarone-indene resins. **Neville Chemical Company**
Paragon—Kaolin. **J. M. Huber Corp.**
Paraplex—Plasticizers and polyester resins. **Rohm & Haas Company**
Parapol-S—High molecular weight copolymer of styrene and isobutylene. **Enjay Company, Inc.**
Parasepts—Anti-fungal and anti-bacterial agents. **Heyden Chemical Corporation**
Parlon—Chlorinated natural rubber. **Hercules Powder Company**
Pastall—Driers. **The Harshaw Chemical Co.**
Pavoco Oil—Bodied linseed oil. **Pacific Vegetable Oil Corp.**
Pavoil—Bodied oil. **Pacific Vegetable Oil Corp.**
Pavolene—Refined linseed oil. **Pacific Vegetable Oil Corp.**
Pavolin Oil—Bodied linseed oil. **Pacific Vegetable Oil Corp.**
Pavasoy—Bodied soybean oil. **Pacific Vegetable Oil Corp.**
Pavosynth—Modified linseed oil. **Pacific Vegetable Oil Corp.**
Paxwax—Microcrystalline waxes. **National Wax Company**
PC 1244—Defoaming agent. **Monsanto Chemical Company**
PCP Castor Oil—Raw expeller oil, unbleached. **Pacific Vegetable Oil Corp.**
PE—Polyhydric alcohol. **Hercules Powder Co.**
PE-16—Emulsion of chlorinated natural rubber. **Alfred Hague & Company, Inc.**
Peerless—Kaolin clay. **R. T. Vanderbilt Co.**
PEI—Polyethylene imine. **Hansborg & Company**
Penbro—"B" wood resin. **Newport Industries, Inc.**
Penbro 83—Limed wood rosin. **Newport Industries, Inc.**
Penglo 65—Tall oil penta ester solution. **Newport Industries, Inc.**
Pennco—Pigment dispersions & chips. **Pennsylvania Color & Chemical Company**
Pennsalt—Metal cleaners, alkaline paint strippers, and paint spray booth water conditioners. **Pennsylvania Salt Manufacturing Company**
Penros—Polymerized wood rosin. **Newport Industries, Inc.**
Pent Acetate—Synthetic amyl acetate. **Sharples Chemicals Inc.**
Pentacite—Pentaerythritol resins. **Reichhold Chemicals, Inc.**
Pentalyn—Pentaerythritol esters of rosin and phenolic-modified pentaerythritol esters of rosin. **Hercules Powder Company**
Pentaphen—Para-tertiary-amylphenol. **Sharples Chemical Inc.**
Pentasol—Synthetic amyl alcohols. **Sharples Chemicals Inc.**
Pentek—Pentaerythritol technical. **Heyden Chemical Corporation**
Perclene—Perchlorethylene. **E. I. du Pont de Nemours & Co., Inc.**
Perlin—Chemically treated linseed oil. **Brown-Allen Chemicals, Inc.**
Permachlor Red—Red dry colors. **Sherwin Williams Company**
Permadine—Zinc phosphate coating chemicals for rust-proofing. **American Chemical Paint Co.**
Permagel—Processed Fullers Earth thickener. **Minerals & Chemicals Corp. of America**
Permanent—Phthalocyanine blue and green pigments. **New York Color & Chemical Co.**
Petrex—Unmodified Petrex alkyd resins. **Hercules Powder Co.**
Petro A A—Surface active agent. **Petrochemicals Company**
Petrodor—Paint solvent deodorants. **Dodge & Olcott, Inc.**
Petrohol—Isopropyl alcohol. **Enjay Company, Inc.**
Petrolene—Aliphatic petroleum thinner. **Anderson-Prichard Oil Corporation**
Petrolite—Emulsifiable waxes. **Petrolite Corporation, Ltd.**
Petronauba—Emulsifiable petroleum wax. **Barreco Oil Company**
Petropon—Heavy petroleum polymers. **American Mineral Spirits Company**
Petro-Resins—Polymerized olefinic hydrocarbons. **Petroleum Specialties Company**
Petrosul—Petroleum sulfonate. **Pennsylvania Refining Company**
Phillips 66—Hydrocarbon solvents. **Phillips Petroleum Company**
Phthalo—Phthalocyanine blue and green pigments. **New York Color & Chemical Co.**
Picco—Solvents & solvent oils. **Pennsylvania Industrial Chemical Corporation**
Piccolastic—Low molecular wt. polystyrene resins. **Pennsylvania Industrial Chemical Corp.**
Piccolyte—Polyterpene resins. **Pennsylvania Industrial Chemical Corporation**
Piccopale—Petroleum hydrocarbon resin. **Pennsylvania Industrial Chemical Corporation**
Piccopale Emulsion—Petroleum hydrocarbon resin emulsion. **Pennsylvania Industrial Chemical Corporation**
Piccoumaron—Coumarone-Indene resins. **Pennsylvania Industrial Chemical Corporation**
P-K—Twin shell blender. **The Patterson-Kelly Company, Inc.**
Planisol—Surface active agent. **The Girdler Company**
Plaskon—Alkyd molding compounds. **Barrett Division**
Plasto—Dyes for plastics. **National Aniline Div.**
Plastoflex—plasticizers. **Advance Solvents & Chemical Corporation**
Plastolein—Chemical & resinous plasticizers. **Emery Industries, Inc.**
Pliolite latex—Styrene-butadiene emulsions. **The Goodyear Tire & Rubber Co. Inc.**
Pliolite, natural rubber—Cyclized natural rubber. **The Goodyear Tire & Rubber Co. Inc.**
Pliolite S-5—Styrene-butadiene resins. **The Goodyear Tire & Rubber Co. Inc.**
Pliovic—Polyvinyl chloride resins. **The Goodyear Tire & Rubber Co. Inc.**
Plumb-O-Sil—Stabilizers for vinyls. **National Lead Company**
Pluronics—Emulsifying agent (nonionic). **Wyandotte Chemicals Corp.**
Plyophen—Phenolic resins. **Reichhold Chemicals, Inc.**
PMAC—High boiling solvent-polymethoxy acetal. **General Aniline & Film Corporation**
PMN 10—Fungicide. **Nuodex Products Co., Inc.**
PMO 10—Fungicide. **Nuodex Products Co., Inc.**
POE—Modified polyester enamel vehicle. **Farnow, Inc.**
Polyco—Resin emulsions. **The Borden Company**
Polyfon—Surface active agents. **West Virginia Pulp and Paper Company**
Polymekon—Specially processed petroleum wax. **Warwick Wax Company, Inc.**
Polymer C-3—Modified vinyl acetate resin. **Monsanto Chemical Co.**
Poly-pale Ester—Glycerol ester of polymerized rosin. **Hercules Powder Company**
Poly-Sperse—Plasticizer. **National Polychemicals, Inc.**
Poly-Tex—Polyvinyl acetate copolymer emulsion. **Jones-Dabney Company**
Polywood Oil—Heat treated wood oil. **Brown-Allen Chemicals, Inc.**
Porox—Grinding balls. **Patterson Foundry & Machine Company**
Preventol—Fungicides. **Antara Chemicals**
Prgmol—Latex emulsion leveling agent. **Fred'k. A. Stresen-Reuter, Inc.**
Propocel—Cellulose derivative. **The Dow Chemical Company**
Protatek 53—Sodium alginate thickener. **Croda Incorporated**
Protectoseal—Equipment for protection against fires through the use of flammable liquids. **Protectoseal Company**
PT—Pine tar, pine tar oil, pine oil, destructively distilled wood turpentine. **Godfrey L. Cabot, Inc.**
Puratized OL-28—Phenylmercury oleate. **Gallowhur Chemical Corporation**
Purecal—Ppt. calcium carbonate. **Wyandotte Chemicals Corp.**
Putrol—Deodorant. **Fritzsche Brothers, Inc.**
PVC 100—Polyvinyl chloride. **The Dow Chemical Company**
PVM—Polyvinyl methyl ether. **General Aniline & Film Corp.**
PVM/MA—Methyl vinyl ether-ethyl anhydride copolymers. **General Aniline & Film Corp.**
PVP—Polyvinylpyrrolidone. **General Aniline & Film Corp.**
PX Plasticizers—Chemical and Resinous Plasticizers. **Pittsburgh Coke & Chemical Co.**
Pycal—Chemical Plasticizers. **Atlas Powder Co.**
Pyrotone Reds—Chlorinated para toners. **Standard Ultramarine & Color Company**

Q

QO—Furan chemicals & derivatives. **The Quaker Oats Company**
Quindex—Copper-8 quinolinolate solution. **Nuodex Products Co., Inc.**

R

R-856 Resin—Silicone-alkyd resin. **Dow Corning Corp.**
R-878 Resin—Silicone-alkyd resin. **Dow Corning Corp.**

Ramapo—Resinated organic pigments. **E. I. du Pont de Nemours & Company**
Raven—Carbon black pigment. **Columbian Carbon Company**
R-B-H—Pigment dispersions. **R-B-H Dispersions**
R C Plasticizer E S—Polymeric plasticizer. **Rubber Corporation of America**
RD 910—Stabilizer-thickener. **Minnesota Mining & Manufacturing Company**
Readco—Mixers & materials handling equipment. **Read Standard Corporation**
RECO Brown—Concentrated brown iron oxides. **Reichard-Coulston, Inc.**
Resimene—Butylated melamine formaldehyde resins. **Monsanto Chemical Company**
Resimene-U—Butylated urea formaldehyde resins. **Monsanto Chemical Company**
Resinox P97—Phenolic resin. **Monsanto Chemical Company**
Resyn—Polyvinyl acetate emulsions. **National Starch Products Inc.**
Resoflex—Plasticizers. **Cambridge Industries, Inc.**
Revolvator—Materials handling equipment. **Revolvator Company**
Reynolds Metals—Aluminum Powder & Paste. **Reynolds Metals Company**
Reynolized—Aluminum paste pigment. **Reynolds Metals Company**
Rezyl—Oil & resin-modified alkyd resins. **American Cyanamid Company**
Rheotol—Surface active agent. **R. T. Vanderbilt Company**
Rhoplex—Acrylic resin dispersions. **Rohm & Haas Company**
Rhoplex AC-33—Acrylic emulsion. **Rohm & Haas Company**
Rodine—Pickling acid inhibitors. **American Chemical Paint Company**
Rotator—Drum truck. **Morse Manufacturing Company, Inc.**
Rubbersol #3—Terpene solvent. **Newport Industries, Inc.**
Rustib—Corrosion inhibitor. **Raybo Chemical Company**
RV—Flatting paste. **RBH Dispersions**

S

Safe-T-Hues—Special non-toxic colorants. **H. Kohnstamm & Company, Inc.**
Safflower 22—Isomerized safflower oil. **Pacific Vegetable Oil Corp.**
Saflex—Polyvinyl butyral. **Monsanto Chemical Company**
St. Joe—Lead-free zinc oxide. **St. Joseph Lead Company**
Santicizer—Chemical plasticizers. **Monsanto Chemical Company**
Santocel—Extender pigment, silica aerogel. **Monsanto Chemical Company**
Santolite—Aryl sulfonamide-formaldehyde resins. **Monsanto Chemical Company**
Sapona Reds—Soapfast reds. **Standard Ultramarine & Color Company**
Saran—Vinylidene Chloride polymers. **The Dow Chemical Company**
Sarkosyls—Emulsifiers and anti-corrosive agents. **Geigy Industrial Chemicals**
Sealed-Disc—Paint filters. **Alsop Engineering Corporation**
Sequestrene—Metal complexing agent. **Geigy Industrial Chemicals**
Ser-X—Extender pigment; Sericite (hydrous aluminum silicate). **Innis, Speiden & Co., Inc.**
Shear-flow—Mixers. **Gabb Special Products**
Ship Pitch—Pitch. **Newport Industries, Inc.**
Sierra Fibrene—Extender pigment; Talc (magnesium silicate). **Innis, Speiden & Co., Inc.**
Sierra Mistron—Extender pigment; Talc (magnesium silicate). **Innis, Speiden & Co., Inc.**
Silastic—Silicone rubber. **Dow Corning Corp.**
Silex—Extender pigment; hard silica. **Innis, Speiden & Company, Inc.**
Silvar—Aluminum pastes & powders. **Silberline Mfg. Company, Inc.**
Skellysolve—Aliphatic hydrocarbon solvents. **Skelly Oil Company**
Smico—Process equipment. **Southwest Mill Industrial Equipment Company**
Smithko—Pigments and extenders. **Smith Chemical & Color Company**
Socal Petrolatum—Waxes. **Standard Oil Co. of California**
Socal Solvent—Aromatic Solvent. **Standard Oil Company of California**
Softex Red—Precipitated pure red oxide. **Reichard-Coulston, Inc.**
Solarite—Hydrocarbon resin. **Solar Compounds Corp.**
Soligen—Paint driers. **Advance Solvents & Chemical Corporation**
Solinox—Process linseed oil. **Spencer Kellogg & Sons Inc.**
Solros—Heat-treated wood rosin. **Newport Industries, Inc.**
Soltrol—Odorless paint solvents & thinners. **Phillips Petroleum Company**
Solvenol—Mixed terpene solvent. **Hercules Powder Company**
Solvent #30—Terpene solvent. **Newport Industries, Inc.**
Solvesso—Aromatic petroleum solvents. **Esso Standard Oil Company**
S-O-M—Sight-O-Matic control of roll pressures. **J. M. Lehmann Co., Inc.**
Sorbo—70% sorbitol solution. **Atlas Powder Co.**
Sovasol—Aliphatic petroleum solvents. **Socony-Vacuum Oil Company**
Soya Paint Oil—Modified soybean oil. **Pacific Vegetable Oil Corp.**
Soya Solinox—Process soybean oil. **Spencer Kellogg & Sons Inc.**
Soyalin—Specially processed soybean oil. **Brown-Allen Chemicals, Inc.**
Soywood Oil—Co-polymerized combination of refined soybean oil and tung oil. **Pacific Vegetable Oil Corp.**
Span—Emulsifiers; fatty acid esters of sorbitol anhydrides. **Atlas Powder Company**
Spangle—Aluminum paint improver. **Raybo Chemical Company**
Sparmite—Very fine barium sulfate. **C. K. Williams & Company**
Sparsol—Vinyl type polymer. **Sparta Industries**
Spectronic 20—Colorimeter. **Bausch & Lomb Optical Company**
Speedee Mite—"Miniature paint factory in a test tube." **Charles E. Barker Company**
SR—Silicone resins. **General Electric**
Stabelan—Vinyl stabilizers. **Harwick Standard Chemical Company**
Staybelite Ester—Glycerol ester of hydrogenated rosin. **Hercules Powder Company**
Stabilizer D-22—Dibutyl tin dilaurate. **Carbide & Carbon Chemicals Company**
Stamford—Aluminum pastes & powders. **Silberline Mfg. Company, Inc.**
Standard—Zinc dust. **New Jersey Zinc Co.**
Standard Refined Wax—Waxes. **Standard Oil Company of California**
Standard Thinner—Aliphatic thinners. **Standard Oil Company of California**
Standardaire—Blower. **Read Standard Corp.**
Stardust—Magnesium silicate. **Tamms Industries, Inc.**
Statex—Carbon black pigment. **Columbian Carbon Company**
Steelco—Distilled tall oils. **K. A. Steel Chemicals Inc.**
Sterling—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Steveco—Mixers, grinding equipment, tanks, fans, blowers. **The Stevenson Company**
Strypp-Away—Liquid paint stripper. **The DuBois Company, Inc.**
Stycast—Polystyrene casting resins. **Emerson & Cuming, Inc.**
Stypol—Polyester resins. **H. H. Robertson Co.**
Styresol—Styrenated alkyd resins. **Reichhold Chemicals, Inc.**
Styretex—Styrenated alkyd resins. **Jones-Dabney Company**
Styron—Polystyrene. **The Dow Chemical Co.**
Sunolith—Lithopone. **The Glidden Company**
Super Ad-It—Fungicide. **Nuodex Products Company, Inc.**
Super Aetna Crimson red Oxide—Produced from crude Persian Gulf red oxide. **Reichard-Coulston, Inc.**
Super Spectra—Carbon black pigment. **Columbian Carbon Company**
Super Three—Roller mills. **Kent Machine Works, Inc.**
Superba—Carbon black pigment. **Columbian Carbon Company**
Super-Beckacite—Pure phenolic resins. **Reichhold Chemicals, Inc.**
Supercarbovar—Carbon black pigments. **Godfrey L. Cabot, Inc.**
Superflo—Linseed grinding oils. **Spencer Kellogg & Sons, Inc.**
Superfyde—Formaldehyde polymer. **Heyden Chemical Corporation**
Superior—Linseed varnish oils. **Spencer Kellogg & Sons, Inc.**
Superior—Soybean varnish oils. **Spencer Kellogg & Sons, Inc.**
Superjet—Lampblack. **C. K. Williams & Co.**
Superlin—Catalyzed refined linseed oil. **Brown-Allen Chemicals, Inc.**
Superoil—Low acid refined linseed oil. **Brown-Allen Chemicals, Inc.**
Super-sol—Odorless naphtha. **Pennsylvania Refining Company**
Supreme—Crushers, pulverizers. **Franklin P. Miller & Son, Inc.**
Suprex—Kaolin. **J. M. Huber Corp.**
Surfex—Calcium carbonate extender pigments. **Diamond Alkali Company**
Suspenso—Calcium carbonate extender pigments. **Diamond Alkali Company**
Susperse B—Anti-sagging, anti-settling, wetting and dispersing agent. **Raybo Chemical Co.**
Swiveloader—Material handling equipment. **Stephens-Adamson Mfg. Company**
Syloid—Extender pigments; silica. **Davison Chemical Company**
Synco—Phenolic resins. **Snyder Chemical Corp.**
Synco 935-D—Cross-linking vinyl copolymer emulsion. **Snyder Chemical Corporation**
SynPar—Hard, high-melting wax. **H. L. Barnebey**
Syntex—Alkyd resins. **Jones-Dabney Company**
Synthe-Copal—Ester gum resins. **Reichhold Chemicals, Inc.**
Synthenol—Dehydrated castor oil. **Spencer Kellogg & Sons, Inc.**
Syn-U-Tex—Butylated urea formaldehyde resins. **Jones-Dabney Company**
Synvarite—100% phenolic resins. **Synvar Corp.**
Synvarol—Butylated urea resins. **Synvar Corp.**

T

T 1215—Polymerized linseed oils. **Spencer Kellogg & Sons, Inc.**
Tasco—Talc. **Tamms Industries, Inc.**
T. C. Mictomite—Calcium carbonate. **Tamms Industries, Inc.**
Tecquinol—Technical hydroquinone. **Eastman Chemical Products, Inc.**
Tescol—Proprietary solvent based on ethyl alcohol. **Eastman Chemical Products, Inc.**
Teflon—Tetrafluoroethylene resin. **E. I. du Pont de Nemours & Company**
Tegiac—Rosin modified dibasic acid resins. **American Cyanamid Company**
Tenex—Heat-treated wood rosin. **Newport Industries, Inc.**
Tergitol—Nonionic and anionic surface active agents. **Carbide and Carbon Chemical Company**
Textile Spirits—An aliphatic naphtha having an evaporation range similar to benzol. **American Mineral Spirits Company**
T-Glo-8 & 8Y—Tall oil gloss oil. **Newport Industries, Inc.**
Thermax, P-33—Carbon blacks. **R. T. Vanderbilt Company**
Thermoil-Granodine—Manganese iron phosphate coating chemicals for wear-proofing and rust-proofing. **American Chemical Paint Company**
Thermolite—Stabilizers for vinyls. **Metal & Thermit Corporation**
THFA—Tetrahydrofurfuryl alcohol. **The Quaker Oats Company**
Thoro Blender—Conical dry blender & mixer. **Patterson Foundry & Machine Company**
Ti-Cal—Titanium calcium pigments. **E. I. du Pont de Nemours & Company**
Ti-Pure—Titanium dioxide pigments, rutile and anatase. **E. I. du Pont de Nemours & Co.**
Titanolith—Titanated lithopone. **The Glidden Company**
Titanox—Titanium dioxide pigments; rutile, anatase, non-pigmentary, titanium calcium. **Titanium Pigment Corporation**
TK—Flatting paste. **RBH Dispersions**
TME—Trimethylolethane. **Heyden Chemical Corporation**
TMP—Trimethylolpropane. **Heyden Chemical Corporation**
Tolbe—Tall oil pitch. **Newport Industries, Inc.**
Toxilic—Maleic acid. **National Aniline Division**
Toximul 250—Emulsifier. **Ninol Laboratories**
Transphalt—Asphaltic hydrocarbon resin. **Pennsylvania Industrial Chemical Corporation**
Transveyor—Compact, low-cost stacker. **Automatic Transportation Company**
Troykyd—Fungicides, puffing & bodying agents, anti-floating agents, anti-sagging agents, anti-settling agents, anti-skinning agents, wetting agents, dispersing agents. **Troy Chemical Co.**
Triangle—Carbon black. **United Carbon Co., Inc.**
Tribase—Stabilizers for vinyls. **National Lead Company**
Triclene—Trichlorethylene. **E. I. du Pont de Nemours & Company, Inc.**
Tri-Homo—Homogenizing machinery. **Tri-Homo Corporation**
Tripentek—Tripentaerythritol technical. **Heyden Chemical Corporation**
Triton—Surface active agents. **Rohm & Haas Company**
Troluoil—Aliphatic petroleum thinner. **Anderson-Prichard Oil Corporation**
Tween—Emulsifiers; polyoxyethylene sorbitan fatty acid esters. **Atlas Powder Company**
Twitchell—Emulsifying agents. **Emery Industries, Inc.**
Ty-Bond—Zinc phosphate coating for metal. **Cowles Chemical Company**
Typhoon Agitator—Portable liquid mixer. **Patterson Foundry & Machine Company**

U

Ubatol—Modified polystyrene emulsion. **Union Bay State Chemical Co., Inc.**
Uformite—Urea-formaldehyde and melamine-formaldehyde resins. **Rohm & Haas Company**
Ultrapole S—Amine condensate. **Ultra Chemical Works, Inc.**
Ultra-Turrax—Colloid Mills. **Cartrite International, Inc.**
Unimixers—Vertical liquid mixer. **Patterson Foundry & Machine Company**
Unipower—Agitator-mixer drive. **Patterson Foundry & Machine Company**
Unitane—Titanium dioxide pigment. **American Cyanamid Co.**
Unitol—Refined Tall Oil. **Union Bag & Paper Corporation**
USS—Aromatic hydrocarbon solvents. **United States Steel Corporation**
Utilitank—Glass lined storage tanks. **The Pfaudler Company**
Uversol—Driers. **The Harshaw Chemical Company**
Uvinul—Ultraviolet absorbers. **Antara Chemicals**

V

Vancide—Fungicides. **R. T. Vanderbilt Co.**
Vandor—Paint deodorant. **van Ameringen-Haebler, Inc.**
Varayd—Alkyds. **Farnow, Inc.**

Varez—Resin solutions. **McCloskey Varnish Co.**
Varkydols—Special drying oils. **McCloskey Varnish Company**
Varkyds—Alkyds, phthalic, non-phthalic and modified. **McCloskey Varnish Company**
Veegum—Magnesium aluminum silicate. **R. T. Vanderbilt Company**
Velsicol—Hydrocarbon resins and aromatic hydrocarbon solvents. **Velsicol Corporation**
Velveteen "R" Silica—Amorphous silica. **Tamms Industries, Inc.**
Venus Natural Copper—Flake Copper Powder. **U. S. Bronze Powder Works, Inc.**
Venus Palegold—Gold bronze powder. **U. S. Bronze Powder Works, Inc.**
Versamides—Polyamide resins. **General Mills, Inc.**
Vibrin—Polyester resins. **Naugatuck Chemical**
Vi-Cron—Very fine ground limestone. **C. K. Williams & Company**
Vinac—Polyvinyl acetate resins and emulsions. **The Colton Chemical Company**
Vinsol—Resin derived from southern pine wood. **Hercules Powder Company**
Vinsol Ester Gum—Glycerol ester of vinsol. **Hercules Powder Company**
Vinylite—Vinyl resins: acetate, chloride-acetate, chloride, alcohol, and butyral. **Bakelite Co.**
Vinymul—Polyvinyl acetate emulsion. **Paisley Products, Inc.**
Violite—Luminescent pigments. **Rhode Island Laboratories, Inc.**
Virginia Red Toners—Chlorinated lithol rubine. **Standard Ultramarine & Color Co.**
Viskoplus—Aluminum naphthenate. **Advance Solvents & Chemical Corporation**
Vistac—Rubber plasticizers. **Advance Solvents & Chemical Corporation**
Voidox—Tertiary butylated phenol. **Guardian Chemical Corporation**
Vulcan—Steel shipping containers. **Vulcan Containers Inc.**
VVF Pigments—Very fine natural iron oxides. **C. K. Williams & Company**
Vygen—Polyvinyl chloride resin. **The General Tire & Rubber Company**
Vynite—Collapsible tubes for paint pigments. **Continental Can Company, Inc.**

W

Wallkyd—Alkyd resin vehicles. **Reichhold Chemicals, Inc.**
Wallpol—Plasricized vinyl acetate emulsion. **Reichhold Chemicals Inc.**
Walltax—Wall sizings. **Hayes Adhesives Co., Inc.**
Watchung—Permanent red 2B pigments. **E. I. du Pont de Nemours & Company**
WC-130—Polyvinyl acetate emulsion. **The Bakelite Company**
Weather-Ometer—Accelerated Weathering Machines. **Atlas Electric Devices Company**
Wet-Ege Spirtis—Aliphatic hydrocarbon thinner. **Anderson-Prichard Oil Corporation**
Wemco—Torque flow solids pump. **Western Machinery Company**
Witall—Tall oil driers. **Witco Chemical Co.**
Witcarb—Precipitated calcium carbonate. **Witco Chemical Company**
Witicizers—Plasticizers. **Witco Chemical Co.**
Witco—Paint driers, surface active agents, & stearates. **Witco Chemical Company**
Witcoblak—Furnace or channel blacks. **Witco Chemical Company**
Wittox—Copper & zinc naphthenates. **Witco Chemical Company**
Wollastonite—Calcium metasilicate extender pigment. **Godfrey L. Cabot, Inc.**
Wonex—Soda-treated wood rosin. **Newport Industries, Inc.**

X

XR-859, XR-875 Resins—Silicone — phenolic resins. **Dow Corning Corporation**
XX—Lead-free zinc oxide. **New Jersey Zinc Co.**

Y

Yelkin—Lecithin—**Ross & Rowe, Inc.**

Z

Zeco—Asphalts, stearine pitches, gilsonite. **G. S. Ziegler & Company**
Zeolex—Ultra fine silico aluminate. **J. M. Huber Corporation**
Zinar—Zinc resinate. **Newport Industries, Inc.**
Zinol—Zinc resinate solution. **Newport Industries, Inc.**
Zirco—Drier catalyst. **Advance Solvents & Chemical Corporation**
Zirex—Zinc resinate. **Newport Industries, Inc.**
Zitro—Zinc resinate. **Newport Industries, Inc.**
Zopague—Titanium dioxide. **The Glidden Company**
Zulu—Phthalocyanine blue & green pigments. **Kentucky Color and Chemical Company**
Zytel—Nylon resin. **E. I. du Pont de Nemours & Company**

NUMBERED

41 Grease—Silicone grease, heat resistant. **Dow Corning Corporation**
129G—Silicone resin for masonry water repellents. **Dow Corning Corporation**
"100 Series" Oxides—Bright pure red iron oxides. **C. K. Williams & Company**
200 Fluid—Silicone additive for paints & enamels. **Dow Corning Corporation**
400 Gum—Dimethyl silicone polymer. **Dow Corning Corporation**
#400 Silver Bond "B" Silica—Crystalline silica. **Tamms Industries, Inc.**
802-806, 840 Resins—Silicone resins. **Dow Corning Corporation**

ADVERTISERS INDEX

Abbe Engineering Co. 123
Advance Solvents & Chemical Div., Carlisle Chemical Works ..... 4th Cover
American Cyanamid Co. ..... 3rd Cover

Bakelite Corp. 16, 17
Baker Castor Oil Co. 87
Barrett Division, Plaskon, Allied Chemical & Dye Corp. 34
Buckman Laboratories, Inc. 80

Cambridge Industries, Inc. 54
Carbola Chemical Co. 59
Celanese Corp. of America, Chemical Div. 69
Columbian Carbon Co. 63
Colwell Color Cards 114
Commercial Solvents Corp. 68

E. I. DuPont de Nemours & Co., Inc. (Electrochemical Dept.) 53
E. I. DuPont de Nemours & Co., Inc. (Whites & Colors) 58

Eastman Chemical Products, Inc. 4
Enjay Co. 72

Fein's Tin Cans, Inc. 124

General Electric Co. ..... Front Cover
General Tire & Rubber Co. 51
Gillespie-Rogers-Pyatt Co. 37

Harshaw Chemical Co. 82

Spencer Kellogg & Sons, Inc. 74
Kinetic Dispersion Corp. 122

Macbeth Daylighting Corp. 134
Minerals & Chemicals Corp. of America 89
Monsanto Chemical Co. 94-95

Neville Chemical Co. 32
Nuodex Products Co. ..... 2nd Cover

M. W. Parsons-Plymouth, Inc. 83
Plaskon, Barrett Div., Allied Chemical & Dye Corp. 34

R-B-H Dispersions, Interchemical Corp. 60
Reichhold Chemicals, Inc. 3
Ross & Rowe, Inc. 85

Sinclair Chemicals, Inc. 70
Sindar Corp. 86
A. E. Staley Mfg. Co. 86
Standard Oil Co. of Ohio 66
Sun Oil Co. 71
Synthetic Chemicals, Inc. 90

Titanium Pigment Corp. 61
Troy Chemical Co. 86

van Ameringen-Haebler, Inc. 84
Velsicol Chemical Corp. 31

T. F. Washburn Co. 22
Witco Chemical Co. 88

ADDITIONAL COPIES

OF THIS

1955

REVIEW

OF THE

PAINT INDUSTRY

for your

- EXECUTIVE STAFF
- TECHNICAL PERSONNEL
- PRODUCTION MANAGERS
- SALESMEN
- ADVERTISING AND PROMOTION DEPTS.
- TRAINEES
- LIBRARY

ARE AVAILABLE

FOR INFORMATION AND DETAILS WRITE

POWELL MAGAZINES, INC.,

855 AVENUE OF THE AMERICAS, NEW YORK 1, N. Y.

coating resins

...a versatile line including many new developments, designed to give you optimum performance, superior film properties

CYCOPOL® Resins (copolymers). Give new high in speed of dry . . . plus durability! For air-drying and baking finishes.

BEETLE® Resins (urea formaldehyde). Used to impart hardness and mar-resistance to baking finishes.

MELAMINE Resins (melamine formaldehyde). For improved color retention, heat and light stability, chemical resistance and exterior durability.

REZYL® Resins (oil and resin modified alkyd resins). Used to provide toughness, hardness, good adhesion, color retention and outdoor durability.

TEGLAC® Resins (rosin modified dibasic acid resins). Superior color retention and high gloss for varnishes, lacquers and cold cuts.

AERO* PHTHALIC ANHYDRIDE • AERO* MALEIC ANHYDRIDE

AERO* METALLIC STEARATES • AEROSOL® SURFACE ACTIVE AGENTS • NITROCELLULOSE

American Cyanamid maintains a large staff of application specialists. These technical service representatives will be happy to assist you in the use of any of these products. Complete technical information and samples available on request. Or ask to have a representative call.

CYANAMID

AMERICAN CYANAMID COMPANY
PLASTICS AND RESINS DIVISION
34P Rockefeller Plaza, New York 20, N. Y.

*Trade-mark

In Canada: NORTH AMERICAN CYANAMID LIMITED, Toronto & Montreal

Trouble Shooters for the protective coatings industry

Having trouble? These paint-makers specialties can help you as they have helped others cure or avert some of the trouble frequently encountered in the paint manufacturing process. The most complete line in the industry, they are readily available for prompt delivery. For additional information on any or all, write to Advance Solvents & Chemical at 245 Fifth Ave., New York 16, New York.

PAINT FUNGICIDES

PMN—Phenyl mercury naphthenate. Gives protection against mildew for the life of the film.
PMO—Phenyl mercury oleate. Meets Federal Specifications for mildew resistant paint additive.
MN—Mercury naphthenate. Gives maximum performance as a fungus resistant additive.

ANTI-LIVERING AGENTS

AALA—Relatively low in acid number. Particularly useful in red lead-in-oil dispersions as assurance against livering, and as an aid to recover livered batches.
AALA (Acidic)—Effective in breaking gels or preventing livering in prussian blue and chrome green enamels and lacquers.

ANTI-SETTLING AGENT

ASET—A surface-active agent, it prevents pigment settling and caking; and aids in wetting and proper dispersion. ASET is not a soap compound. ASET will not appreciably change paint viscosities.

ADVAWET #10

A valuable non-ionic emulsifier in latex paint formulations; aids in stabilizing pigments and resin solids; imparts good flow properties; has minimum foaming, excellent can stability and shelf life.

ADVAWET #33

Non-ionic surface agent. Used successfully for years in emulsion paints; helps develop color strength in organic and inorganic pigments, improves stability, flow, and ease of application; has practically no foaming qualities.

ADVANCE CALCIUM PULP

An improved product, outstanding for use in putty to prevent oil-pigment separation. In paint it aids suspension, ease of brushing and controlled penetration.

STABILISAL C

Recommended as an addition to bronzing and dipping lacquers to prevent greening in the tank, and to restore the original color of the lacquers already turned green.

VISTAC #1 IN CAULKING & GLAZING COMPOUNDS

Vistac, a synthetic, oily hydrocarbon polymer, forms a non-oxidizing binder that imparts excellent adhesion to the compound. Either gun or knife grade compounds containing Vistac have good body, show no sagging or creeping, and maintain internal softness for easy workability.

VULTAMOL

A granular brown powder, readily soluble in water. Used as a dispersing aid for carbon black, zinc oxide and other pigments prior to mixing with natural rubber latex or GR-S latex. Acts as a stabilizing agent for latex mixtures with no tendency to cause foaming, fermentation or mildew formation.

ANTI-SKINNING AGENT

ASKA—A superior anti-skinning compound. Excels in odor and effectiveness. Used in synthetic or ortho dox paints, enamels and varnishes.

ANTI-FLOODING AGENTS

AAFA (Liquid)—Helps reduce flooding and floating of chrome greens, iron blues, carbon blacks, and some iron oxides. Excellent wetting out characteristics and stabilizing properties.
AAFA #2 (Powder)—Overcomes flooding and floating of carbon black, iron oxides, titanium dioxide, chrome greens, prussian and iron blues, and certain organic reds. Modifies variation in surface tensions. Acts as colloidal dispersant, checking pigment separation. Can be used in all white tinting paints.

ANTI-SAGGING AGENTS

AASA—A non-ionic surface active agent which contributes thixotropic action to vehicles which show pronounced sagging. Works particularly well in white paints containing titanium-calcium sulfate pigments.
AASA #7—Effective in white paints containing titanium dioxide ground in alkyds as well as in oleoresinous vehicles, and may be utilized in other color systems.

PUFFING AGENTS

APA—Produces uniform and permanent viscosity. Is fully soluble and compatible with paints and varnishes, and has no deleterious effect on gloss, color or drying time. Used with APA #2 it forms a strong bodying agent for alkyd flats.
REACTION IS COMPLETE WITHIN 2 HOURS.
APA #2—Used where gloss oil, limed tall oil, or other similar vehicles are used. Works well with most alkyds and long oil paints.

ADVAGRIND

Pale colored, easy handling, synthetic non-oxidizing, heavy bodied hydrocarbon, very effective roller mill grinding aid.

●

ADVANCE TECHNICAL SERVICE

Perhaps our most important asset, our Technical Sales Laboratory with its more than 20 years experience in solving problems of the Protective Coatings Industry stands ready to help paint makers solve any problems that may arise.

ADVANCE SOLVENTS & CHEMICAL
DIV. OF CARLISLE CHEMICAL WORKS, INC.
245 FIFTH AVENUE, NEW YORK 16, NEW YORK